

PRINCIPLES FOR MUSEUM DOCUMENTATION

BY

HELENE FERDA LELONG IMMELMAN

This thesis is submitted in partial fulfilment of
the requirements for a degree of Doctor of
Philosophy in the Department of Information Studies,
University of Natal, Pietermaritzburg.

December 1993

This thesis represents the original research of
the author except where specific
acknowledgement is made.



ABSTRACT

This study examines the present state of collection and information documentation in museums to-day and the problems encountered during automation of the information unit records.

The author examines library and information science theory and attempts to develop general principles for the establishment of information systems in museums. The principles postulated include suggestions for descriptive and subject documentation as well, as being part of the composition of the information system.

The proposed principles are then tested against the reality in a number of institutions and extant systems, both descriptive and subject. The emphasis is naturally on the situation in South Africa. The conclusions drawn, test the suppositions which the author postulated and showed that the principles are viable.

ACKNOWLEDGEMENT

This study would not have been completed without the help, encouragement, assistance and forbearance of Mr G Balkwill, and Miss E. Retief in particular among many friends and colleagues who provided assistance during the research for this study.

TABLE OF CONTENTS

Acknowledgements	iii
Table of Contents	iv
Proposal	
Statement of the problem	ix
Importance of the problem	
Method of study	
Chapter 1: An historical overview of museum and documentation practise	1
1.1 Introduction	1
1.2 Museums	3
1.3 Museum ideals	6
1.4 Museums in South Africa	10
Chapter 2: Museums and information	14
2.1 The museum as an information institution	14
Chapter 3: Museum documentation	26
3.1 History of museum documentation	28
3.2 Concern over documentation	31
3.3 The museum information system	40

3.4 The purpose of the museum information system	43
3.5 The functions of the museum information system	44
3.6 The procedures of the museum information system	46
3.7 Supplementary information	55
Chapter 4: The quandary of museum information	
4.1 Introduction	57
4.2 Features	58
4.3 Problems	61
Chapter 5: Systems and solutions	
5.1 Introduction	78
5.2 System elements	80
5.3 System requirements	89
5.4 System constraints	120
Chapter 6: Principles and a Code	
6.1 The concept of principles and a Code	126
6.2 Use of the principles	141
Chapter 7: The principles of an information system	
7.1 Introduction	145

7.2 Statement of scope	147
7.3 Principle 1: Purpose of museum information systems	153
7.4 Principle 2: The functions of an museum information system	166
7.5 Principle 3: The components of an information system	176
7.6 Principle 4: The structure of the information system	197
7.7 Principle 6: The organisation of the information system	202
Chapter 8: Descriptive documentation	
8.1 Introduction	212
8.2 Principle 1: The purpose of descriptive documentation	214
8.3 Principle 2: The structure of the record	220
8.4 Principle 3: Components of a descriptive documentation system	235
8.5 Principle 4: Multiple access points to an information unit in an information system	248
8.6 Principle 5: The structure and form of standardised access points	254
Chapter 9: Subjective documentation	306

9.1 The subject approach	307
9.2 Principle 1: The purpose of subject documentation	310
9.3 Principle 2: The creation of a subject documentation system	331
9.4 Principle 3: The elements of a subject documentation system	348
9.5 Principle 4: The structure of a subject documentation system	392
Chapter 10: Evaluation of the principles	
10.1 Introduction	450
10.2 Background to the systems	452
10.3 The questionnaire	467
10.4 Conclusion	518
Chapter 11: Final conclusion	539
Tables and appendices	
Table 1: Comparison of information institutions	609(a)
Table 2: Comparison of information categories	609(b)
Table 3: Different filing methods	609(c)
Table 4: Information system access methods	609(d)
Table 5: Principles of syntax and orders	609(h)

Table 6: Vocabulary of different information systems	609(i)
Table 7: Types of relationships found in information systems	609(j)
Table 8: Equivalence relationships	609(k)
Table 9: Types of hierarchical relationships	609(l)
Table 10: Principles	609(m)
Glossary	610
List of works cited	658
Thesaurus	690

THE PROPOSAL

Statement of the problem

"Museums throughout the world have an overwhelming documentation problem. They are being inundated with objects and data which they have the responsibility to catalogue and index. Yet they have insufficient resources to cope with the inundation" (Roberts and Light 1980: 42).

This study endeavours to use the theoretical framework provided by Information Science theory, Systems theory and Librarianship to show how the problems encountered in museum information systems can be solved.

The theories involved will be studied for their application to both manual and automated information systems, as both types are found in museums and will continue to be for the foreseeable future. Emphasis will be on the documentation of objects and the information relating to them as opposed to bibliographic or archival material. The

thesis is advanced that manual systems should be designed to allow for easy conversion to automation at a later date. The implication is that both manual and automated systems must be designed according to a common set of principles if the conversion is to be successful.

Importance of the problem

All a museum's activities centre around its collections and without adequate records, inadequately indexed, it is impossible to control or utilize them properly. A museum is also a public institution supported by public funds and is accountable for the collections entrusted to it.

Until recently no coherent body of suitable principles existed to act as guidelines in the organisation of collection records. The framing of such principles serves to encourage institutions to measure their performance and make the necessary corrections.

Method of study

This study is based on a survey of museological, library and information science literature and the practical application of the suggested principles in several institutions and against published systems.

Personal comments arise from 20 years spent associated with the development of the documentation project at the Transvaal Provincial Museum Service and involvement with the Documentation Group of the Southern African Museums Association. Both organisations are involved in the promotion of better documentation practise.

CHAPTER 1

AN HISTORICAL OVERVIEW OF MUSEUM AND DOCUMENTATION PRACTICE

1.1 INTRODUCTION

During the last twenty years museums have faced the results of the information explosion which is affecting all walks of life, and they are expected to organise this information and make it available to users. (Roberts and Light 1980: 42)

" Museum information is a subject which has come to the forefront of thinking among museum professionals, internationally at the same time as the museum's view of itself and its relationship to its community is changing. South African museums have followed this trend and become far more service oriented to both their communities and outside users" (Immelman 1983: 229).

The emphasis on service led to an examination of possible "products" which are available for the marketing action. The most important one is seen to be the information contained in the institution and

its collections. This information is used for all the museum's activities (education, publication, research and collection). The museum is no longer seen merely as a repository for objects but also as an information centre in the community and is expected to provide information on a wide range of topics, from objects to localities, people, places, events and bibliographic references relating to its collections and environment. But it is essentially the information relating to the three dimensional objects which is unique and is preserved nowhere else in our society (Light 1986: 1; Roberts 1985: 1). This means that the museum should be collecting information and structuring records on all these topics (Immelman 1983: 229). This involvement in the information explosion led museums to examine the possibility of obtaining help from technology in general and computers in particular (Balkwill 1983: 209; Immelman 1983: 229). Computerisation or the use of electronic data processing to handle museum information, was seen as a solution to the problems of:

- increased quantities of data
- lack of sufficient finance

- increased demands for information

(Chenhall 1975: 33-34; Squires 1970: 216-226).

The following examination of this supposition will show where the problems arose, examine solutions tried and suggest possible principles which could be used to solve the problems, or some of them.

1.2 MUSEUMS

The International Council of Museums (a non-governmental body of UNESCO known as ICOM) defines the museum as "a non profit-making permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits for the purpose of study, education, and enjoyment, material evidence of man and his environment

(August 1983: 141). It is, along with the library and the archive, one of the primary information resources in society and it is essential that the data it holds is accessible to all, both public and professional.

There are estimated to be between ten and twenty thousand museums in the world (Burcaw 1975: 26; Roberts 1980: 42): the United Kingdom has

approximately one thousand (Roberts and Light 1980: 43) and South Africa over three hundred (Fransen 1978: 13-209). Many of these museums have only one or two members of staff, frequently with no professional training.

They may be funded by public bodies at different levels in government or be privately funded by corporations or individuals.

The problems experienced by museums are universal. The level of funding is generally unsatisfactory and has directly affected staff (quantity not quality) and non - visible functions such as documentation have not received the attention they deserve.

The professional aspect of museums has been supported for some time by professional organisations. The Museums Association in the United Kingdom was founded in 1888, the American Association of Museums in 1906 and the Southern African Museums Association in 1936, amongst others. (Brain and Erasmus 1986: 5)

These organisations saw it as part of their brief to provide training and advice to the profession. Workshops and informal training sessions were

organized. These were eventually formalized into certificated courses which the authorities recognized often by default of anything else being available.

In England the Diploma of the Museums Association ran on voluntary tutoring in both curatorial and technical practise, offered by senior members of the profession to interested individuals. It evolved into a highly successful annual programme which offers the opportunity to study part - time for a recognised certificate. This Certificate has now been incorporated into the post - graduate qualifications in museology offered by the Department of Museum Studies at the University of Leicester (University of Leicester. Department of Museum Studies. n.d.: 1).

The Southern African Museums Association has followed this pattern, offering certificates initially in collaboration with the British Association but later on its own. This was a result of growing anti - South African sentiments which reduced / negated attempts at collaboration. The Technical Certificate is still a flourishing venture by the Association to serve its members with 13 enrolled candidates (R.M.Tietz 1987: pers comm.).

One of the first post - graduate courses in museology was that offered at the University of Leicester in the United Kingdom in the newly established Department of Museum Studies in 1966. In South Africa similar courses were started at the Universities of Pretoria and Stellenbosch in 1976.

Among the problems which were recognised at an early stage as requiring attention was that of the methods used in record keeping for collections in museums. The field came to be called museum documentation. But the complexities of the problem were such (detailed in Chapter 4) that it was only with the development of the information sciences and electronic data processing that there seemed to be an answer.

1.3 MUSEUM IDEALS

The ideal museum is an institution which exhibits a number of aspects, which with time have come to be considered the special tasks of the museum. A glance at the ICOM definition reveals them.

Museums are seen as institutions housing collections. Man appears to have a psychological need to collect, which is seen in both the archaeological and the written records. Collections accumulated in temples as visible evidence of man's devotion. Later collections came to be regarded as sources of learning and inspiration, both spiritual and intellectual, which in some ages carried social prestige as well.

The intellectual use of collections reappears during the Renaissance and remains a permanent feature in the Western European intellectual tradition.

The use of collections as sources of spiritual inspiration was doubtless present in the temples of ancient Greece and also in the response to church art during the Middle Ages in Western Europe. This tradition continues today in the art galleries where aesthetically beautiful objects are regarded as worthy of study, regardless of their context.

The organization of intellectual knowledge became a feature of western thought from the sixteenth century on and became especially entrenched in

museums. This is best exemplified in the emphasis which is still placed on the study of taxonomy in natural history collections.

During the eighteenth century Age of Enlightenment, two other ideas of importance came to the fore : one was that collections were a source of education (not just intellectual inspiration) and the other was that all people should have equal access to learning. Collections as sources of learning led to private collections becoming public property e.g. the collection of Sir Hans Sloane which formed the nucleus of the British Museum "given to the nation".

The ideal of equal opportunity in education was difficult to achieve when the majority of the population was illiterate and strong lines of social stratification marked all social activities. But the principle of open, public collections became established in this period.

This trend was fuelled throughout the late eighteenth and into the nineteenth century when the revolutions in Europe resulted in the large private collections of the nobility being dispersed. In France the French Revolution emphasized, among other

principles the right of all people to an education and benefit from taxes paid. So, if the museum was supported by public monies, John Citizen had the right of entrance and the right to understand what he saw. These ideas transformed the museum from a private institution for the scholarly into a public institution with a brief to educate. From this point on, the scholastic importance of museums and their social importance are the twin themes of their development.

The social responsibilities of museums to the broad public were first developed in the United States where institutions implemented the concept, by emphasizing formal and informal education programmes for the individual and society as a whole, as part of their normal functioning. The use of museums to achieve social change are best seen in the displays developed in totalitarian and communist countries from the 1930's onwards. Nazi Germany and Communist Russia provide good examples.

By the mid-twentieth century the museum is seen as an institution with research, education, and social functions which are all derived from its collections. The social responsibility of public institutions has become a marked feature of public

life in the later twentieth century and it has forced museums to examine their methods of curatorship; public accountability has forced museum personnel to examine the methods by which it is achieved. One of the methods is the careful record keeping of the collections i.e. museum documentation (Encyclopaedia Britannica 1963: 967-973). Along with these traditional roles, the museum is acquiring another role that of a provider of information. Although this aspect is inherent in all that museums do, it is only now being explicitly stated that the museum is an information institution along with the library and the archive in the community.

1.4 MUSEUMS IN SOUTH AFRICA

In South Africa the first recorded collection of natural history objects, accessible to the public existed in Cape Town, from the founding of the colony in 1652. It was a collection of mounted skins housed in the Fort, chiefly for the benefit of visitors. (Summers 1975: 1) Another early collection dating from the eighteenth century, consisting of books, pictures, natural history objects and ethnological material was bequeathed by the merchant, J.N. von Dessin, to the Groote Kerk in

Cape Town. The collection was displayed in the Sexton's House from 1764 to 1821 for the delectation of the local public. It was later absorbed into the collection of the South African Museum, founded in 1825 by Andrew Smith (Fransen 1978: 5; Summers 1975: 5-4).

Museums developed in a number of centres during the course of the nineteenth century:

- 1856 the Port Elizabeth Museum, Port Elizabeth
- 1857 the Albany Museum, Grahamstown
- 1877 the National Museum, Bloemfontein
- 1884 the Kaffrarian Museum, King William's Town
- 1887 the Durban Museum, Durban
- 1893 the Transvaal Museum, Pretoria

Most of these museums hold general collections devoted to the natural sciences, history and ethnology.

Specialist museums developed during the last quarter of the 19th and the early 20th century. The South African National Gallery, although founded in 1871, only moved into its own building in 1930. Specialist cultural history museums appeared during the present century, although history departments did exist in general institutions (Fransen 1978: 7).

Most museums are funded by either a central government department, a local authority, a university or a private individual, or concern. All are co-ordinated at a national level by the Southern African Museums Association (Fransen 1978: 9). There is no co-ordination at government level as the National Advisory Council for Museums was disbanded in 1985.

The museums are divided for administrative purposes according to their funding body into national, provincial, municipal and private which includes university, private and business museums. The national museums, called Declared Institutions are financed by the Department of National Education and are under the control of Boards of Trustees. The four provincial Museum Services render partial financial aid to smaller museums within their

region. These small local authority museums are either responsible to a Board of Trustees or to the Town Clerk of the municipality concerned. The university museums are usually small, seldom well organized and usually part of a department as a teaching collection. They are funded by the University authorities. The private museums are funded by commercial concerns often as a public relations exercise e.g. the Kimberley Mine Museum, rather than for the intrinsic interest or value of the collections themselves (Fransen 1978: 9-10). In the author's experience private museums are open to the public on appointment .

CHAPTER 2

MUSEUMS AND INFORMATION

2.1 THE MUSEUM AS AN INFORMATION INSTITUTION

In this discussion it is the contention of the author that the museum is an information institution in our society because it supplies information to the public and creates new information through research.

Information has always been of crucial importance to man (Shillinglaw 1988: 9). It is a key resource in our society (Turner 1987: 1). The ability to accumulate information about our environment and ourselves, systematize it and pass it on to others is one of the major distinguishing features of mankind. Through this process mankind has been able to master its natural environment, begin to understand its own nature and improve its material wealth (Shillinglaw 1988: 9-10). Kent (1966: 14) states unequivocally that the availability of information is essential to the maintenance of a civilised society.

2.1.1.1 NATURE OF INFORMATION

The question may be asked "what is information ? " It is essentially a "thing " or product that is communicated between people but unlike other products it cannot be consumed (Ashworth 1979: 37). In the commercial world individual items of information may appreciate or depreciate in response to market forces because they can be made exclusive, and proprietary (Grant 1988: 105). Information can be enhanced by the processing, collection and correlation of isolated data : by analysis from a certain point of view or rewritten for a better understanding (Ashworth 1979: 37). It may be fact, fiction, or merely interpretations of the same (Buchanan 1979: 9). The important thing is that it is communicated.

Information has traditionally been stored in people's minds and updated and modified through social contact, learning and communication (Turner 1987: 1). But as society grew more complex so the information it accumulated and the information it acquired grew in quantity and complexity. Information became a "product" in society which is associated with the development of urban centres,

communication, trade and increased literacy (Vickery 1987: 2). The urban centres made formal provision for the transfer of information through writing, the people to do it - scholars and scribes - and the institutions to house it - palaces, temples and record offices (Vickery 1987: 4). The city encouraged specialisation : diverse institutions developed in order to meet this need. They include markets, theatres, law courts, libraries, hospitals, auditoriums, laundries, beauty parlours, hotels and museums (Vickery 1987: 1).

Since the earliest times archives, libraries, and museums have existed whether scholarly, private, royal, ecclesiastical or public. And through the centuries, as society became more complex, other forms of communication developed e.g. printed books, newspapers, periodicals, microforms and electronic communication in radio and television. The generation, dissemination and search for information is seen as a distinctive product of urban culture (Vickery 1989: 4).

Through time society's attitude to and utilisation of information also changed. In the pre-industrialised society information was regarded as a passive tool used to carry out certain

activities. After the industrial revolution the role of information changed to a dynamic one where it was necessary for innovation, problem solving, and decision making. This required the organisation of a body of theoretical knowledge and a supply of accurate and reliable information (Shillinglaw 1988: 10). This is as true for the museum as for any other field.

People also realised that the power of information is considerable and that one form of poverty is information deprivation (Turner 1987: 1). It can be seen that the elderly, the poor, the unemployed, the disadvantaged or the scientist without access to appropriate information, all suffer from information deprivation.

As can be appreciated information is a dynamic resource in our society, of central importance to the scholarly, economic or social issues being dealt with. It is essential that the available resources be utilised to their best advantage.

2.1.2 THE "INFORMATION " INSTITUTIONS

Three main "information " institutions have been identified in our society as: the library, the archive and the museum . Each fulfils a particular function and although they are closely allied, they are not the same.

The library is defined as " a collection of books or other literary material kept for reading, study and consultation"(Harrod 1971: 378) or as "an institution which collects, preserves, organises and makes available recorded communication" (Landau 1966: 248-249).

The museum is defined as "any permanent institution which conserves and displays for purposes of study, education and enjoyment collections of cultural or scientific significance (August 1983: 141). Or "a non-profit institution in the service of society and open to the public which acquires, conserves, researches, communicates and exhibits for the purpose of study, education and enjoyment, material evidence of man and his environment" (Southern African Museums Association. Documentation Group 1979: 2).

Archives are defined as "public records or historical documents kept in a recognised repository" or "written documents or annexures to them compiled for the purposes of, or used during, a public or private business transaction of which they form a part and which are preserved" (Harrod 1971: 50). Table 1: A comparison of information institutions at the end of this study shows the remarkable differences and similarities between these institutions.

All three institutions have a commitment to serve the community through making information available. The user group, form and type of information can differ greatly, but they all perform their service function through making information in their collections available. This is done by describing the collection unit on a record. The form which their record takes also varies, but in all cases it is an essential feature of the organisation and later use of the collections.

2.1.3 THE INFORMATION PROBLEM

After World War II increasing quantities of information were generated and disseminated and museums, along with other information organisations

in society had trouble coping with it (Turner 1987: 1). As pointed out by B.C.Vickery (1970: 1) modern society incessantly produces and uses information "All technical activity takes place in a complex environment that is based on specially acquired information. At the same time every act gives rise to information and recorded knowledge grows apace."

The increasing knowledge is frequently recorded in journal literature, research reports and monographs which lead to increasing specialisation of topics covered and prove problematic to traditional bibliographic methods of subject recognition (Shera 1972: 71). In museums the collections also grow apace (Roberts 1985: 16).

The information explosion led to the increasing size of institutions in terms of collections, staff, buildings, programmes and users (both actual and potential). This in turn created problems in organisation and communication (Ashworth 1979: 6; Communication 1971: 5).

This information problem was also aggravated by the traditional forms of communication in the research community which is slow (Vickery 1970: 8). There is

frequently a lapse of up to two years between a research project being completed and its being mentioned in a review. In most scientific communities there is a well developed informal network among individuals in the same field. It operates through correspondence, circulation of reports, and conferences (Vickery 1970: 8).

Within this welter of information the user faced the problem of locating the appropriate information when it was needed (Shillinglaw 1988: 22). It may be scarce or non-existent: if it does exist the user might not know how to look for it, or it may be unavailable. The organisations dealing with information had to find ways to cope with this flood. This they did by developing the concept of information systems to assist in organising and communicating the information and so solving some of the issues in information deprivation, the information explosion and the increasing power of information as a social resource (Communication 1971: 5; Turner 1987: 1).

2.1.4 COMMUNICATION OF INFORMATION

As already seen information is a product, but what sort of product? Information is defined as "any recorded fact which it may be necessary to house and arrange so that it can be communicated and used at a later date (Kent 1965: 21). Orna (1980: 3) defines information as that which is capable of transforming the structure of ideas by means of communication between human beings for useful purposes.

The question can be asked "what form does the recorded fact take?" It may be found written in books or documents, spoken on film, record or tape; or a visual communication such as an artwork, photograph, chart, map, decoration, or three dimensional item from either the domains of cultural or natural history (Kent 1966: 19). They all carry encoded data which can be communicated to those who know how to "read" them (Schlereth 1982: 43).

The second aspect of information is that it must be communicated: and communication implies the act of sharing, transferring or transmitting something

(Concise Oxford 1964: 244). In this case the "something" is information relating to the museum collections.

Communication also implies a certain process or act of communication which always has three components, a sender, a message and a receiver (Vickery 1987: 13).

Sender --- message --- receiver

feedback

The message travels in a channel. In the context of the museum information system the sender is the original information unit; the message is the formalised record constructed for the information unit and the receiver is the user (after Awad 1983: 60).

In the transaction, those on the giving side structure the knowledge so that those who receive it can use it to change the structure of their own knowledge (Orna and Pettit 1980: 3). In general,

this process of structuring the knowledge and organising it so that it can be found again is called information retrieval.

As can be seen the act of communication requires that the information be formalized and that a certain means is used to transmit it. The formalized record of the information is the information system record which acts as a surrogate for the real information unit and can be manipulated as required (Arnold, Hill and Nichols 1966: 1; Hoffman 1976: 41-45; Open University 1975: 11).

The physical form on which the information is encoded is called the recording medium (Kent 1965: 157). In museums the most commonly used recording mediums are paper, cards or electronic forms, which can easily be searched depending on the facilities available (Kent 1965: 23).

In order to complete the organisation of the formal communication channel the information must be organised so that it can be retrieved as required (Orna and Pettit 1980: 31). This is dependent on the introduction of some form of identification of the information in the system and the ability to organize it in a useful mannner (Kent 1965: 24; Orna

and Pettit 1980: 32). The organisation which does this is called an information system and in the museum can be equated with the documentation system.

2.1.5 CONCLUSION

It has been suggested that the museum is very definitely a service institution in the community and that service is rendered through the information in the institution. The information system is essential to all aspects of the service which is rendered. The information system will in turn be determined by the supply of information which it is expected to provide.

CHAPTER 3

MUSEUM DOCUMENTATION

Museums were for many years completely unaffected by the information explosion, nor did the professional philosophies extend to the idea of "service" being a paramount function in museums. However by the 1960's museums were being pressured to meet the information demands made on them because of increasing pressure for collection control (Roberts 1985: 32).

Museums have traditionally had a commitment to knowledge, usually in a research context and have seen themselves as having a service commitment to the wider community, even though this concept has always been rather nebulous (Turner 1987: 9). However if museums accept that "service " is one of their basic functions (see the definition given earlier) then ways must be sought in which it can be rendered. One obvious manner is through making the information stored in the museum, which is quite considerable, more readily available. The information provided in exhibitions or publications is just the tip of the "information iceberg".

In order to do so it must be systematically organised. This is a necessary prerequisite for all service (Hoffman 1967: 9). Museum information was in the past organised to a minimal extent, enabling staff to retrieve items when needed (most of the time).

Service can be rendered by incorporating the museum's information into an information or documentation system which will include all information concerning the collections or of relevance to the museums' curatorial functions and allows the use, control and preservation of this information (Roberts 1985: 25). It involves matching the information needs of users with the information items that resolve those needs. Traditionally this has meant supplying users with collection items. It has recently meant supplying information and for bibliographic queries, access to information on computer databases (Turner 1987: 3).

If the museum accepts its service function, through the provision of information it will be actively engaged in the dissemination of information to users through various means internally and externally, such as exhibitions, lectures, publications, answers to queries and active educational programmes (Turner

1987: 3). The system chosen must be "sure-fire " because information is a costly resource to acquire and utilise. Given the increasing importance of information in the activities of the museum and in research, the management of the proposed system is best given as the sole responsibility to one person or department (Turner 1987: 2). It is suggested the information system is housed in an Information Centre or Department which can also house the library, documents and manuscript collections.

3.1 HISTORY OF MUSEUM DOCUMENTATION

When the museum was small it was possible to maintain adequate control over the collections by physical inspection and memory. However as the collection grew this became increasingly difficult until it was impossible to rely on memory to relate all the details concerning an object to it or to link it to other objects. Some form of written record became necessary simply to maintain control over the objects. Under these circumstances adequate documentation became essential.

The first type of documentation was the accessions register which also acted as an inventory of the museum's holdings. It was usually arranged according to the accession number with a brief description of the specimen, its origin and date of entry into the museum. While collections were small this was entirely adequate as a record of the collections and an easy means of tracing different aspects of the collections which were needed (Guthe 1970: n.p.; MacBeath 1969: 49; Mann 1988: 8).

Once the collections grew beyond the stage at which the curator could rely on his memory, the need for several access points to the information in the information system became evident. Up to this point in time the museum usually had an accessions register and sometimes an index.

The first step towards a multiple-entry information system was the sheaf catalogue. Each entry was typed onto a separate page or slip of paper and these were then pasted onto loose pages and placed in a ringbinder. Sometimes one or more entries were pasted on a page. This method had the advantage of being easy to implement and the entries could be pasted up in any arrangement the curator chose.

Unfortunately there were very real disadvantages in this method as the ringbinder lacked security i.e. the pages could easily be removed by unauthorised persons. Or the pages tore around the holes with a great deal of use. One found that more than one entry per page necessitated continual rearranging and repasting of the entries to accommodate new material. There was lastly the problem of the clerical work connected with the typing and pasting of entries which could easily fall behind, i.e. the information system was never completely up to date (Norris 1960: 138-139). This was the first type of information system introduced into the Drostdy Museum, Swellendam (C.Cochrane 1987: pers. comm.)

The most popular form of information system over the last few decades has been the card catalogue. Here the entries for the information system were typed onto cards, and filed in any order the curator required. The advantage is that the cards could easily be typed and arranged in different sequences. It was also easy to keep the information system up to date. Unfortunately the size of the card could be a limiting factor if one wished to enter more information onto the card than space would allow. There was also a lack of security as the card could easily be removed from the card tray. This was

overcome by inserting a rod into the tray which ran through holes punched at the bottom of the cards (Chan 1981: 3; Norris 1960: 139-141; Wynar 1980: 3).

The advent of the card catalogue induced the museum to attempt multiple indexing of the collections so that the information associated with and inherent in the specimen was readily accessible. The indexes were generally organised by accession number, general or specific classification or name. But these indexes were always inadequate due to the cost of the normal printing methods, the work in their preparation and upkeep, the continued growth of the collections and the lack of certainty in the classification used (Lewis 1965: 12-22).

3.2 CONCERN OVER DOCUMENTATION

Since World War II there has been increasing professionalism among museums; one aspect of this has been an awareness of their social obligations to the community and in parallel an increased awareness of the importance of good documentation (Light 1986: 2; Roberts and Light 1980: 42). This has been particularly noticeable since the 1960's (Roberts and Light 1980: 42). It is reflected in periodical literature and in the founding of

specialist organisations such as the Museum Computer Network (U.S.A.), Canadian Heritage Information Network (Canada), Museum Documentation Association (U.K.) and the Southern African Museums Association Documentation Group (R.S.A.).

The increasing professionalism led to more attention being paid to what the museum saw as its social obligations which led to attempts to exploit the collections better. This in turn highlighted the deficiencies of existing documentation systems.

Museums have also found that the early collections are, judged by today's standards inadequately documented. The early records are less detailed, less reliable and less well maintained than one would wish. There is frequently only one handwritten record and no indexes (Roberts 1985: 16).

The emphasis on accountability in recent times has led to new material being better documented than the old, and programmes to redocument old material. This is particularly pronounced in Europe and America (Roberts 1985: 16).

The advent of the computer and the possibility of creating all the required indexes and records by a single entry of information seemed the answer to the problems facing museums. The adventure with computers started in the early 1960's. The National Museum of Natural History of the Smithsonian Institute appears to have been among the first to try to computerise its collection records. The emphasis in those years was on the development of special programs especially for use in museums. In the USA five appeared: SELGEM (Smithsonian Institute), GRIPHOS (Museum Computer Network), GIPSY (University of Oklahoma), TAXIR (University of Colorado, Boulder), GIS (an IBM product used in Flora North America project) (Sarasan and Neuner 1983: 5-6).

Increasingly problems were encountered in these systems. It was found that the programs had difficulty in handling museum data to provide the logically related indexes required. In the mid and late 1960's developments in the United Kingdom led to the formation of the Information Retrieval Group (IRGMA) of the Museums Association in 1967. A resolution taken at the Sheffield Colloquium in April of that year stated that "the Museums Association should actively concern itself with the

various problems involved in adequate information retrieval from museum collections; set up working parties in a series of subjects and through its Education Committee consider including instruction in information retrieval techniques in the Museums Association syllabus" (Museums Association 1977: 11).

In England IRGMA rapidly co-ordinated different individual initiatives by members of the profession and established several objectives:

- to develop an interdisciplinary museum documentation system. This would involve standardised recording formats, terminologies and classification systems.
- develop the necessary computer program to provide a mechanised retrieval should it be sought. The program should allow the transfer of data between computers, between program packages and between different subjects (Museums Association 1977: 11; Porter, Light and Roberts 1976: 1).

In the period from 1967-1977 the IRGMA Committee and its successor the Museum Documentation Association (MDA) produced remarkable achievements:

- the nature of museum data was determined
- the data standard was proposed (Hackman 1973: 10; Roberts and Light 1980: 68)
- recording formats for different disciplines were published (Museums Association 1976a - 1976h; Museum Documentation Association 1980d: 1-148)
- computer program capable of the inter-disciplinary handling of museum data was written (Museum Documentation Association 1980b: 1-26)

In 1977 IRGMA was disbanded and the Museum Documentation Association (MDA), a non profit - making company was formed to continue this work. Salaried staff, R.B.Light and D.A.Roberts were appointed. The influence of the MDA has been seminal in promoting the development of multi-disciplinary data processing and the application of information science theory to the problems encountered in museum

documentation. Since the publication of their first recording media and manuals in 1977 they have been acknowledged leaders in the field.

However before the first MDA publications appeared in 1977 many organisations or institutions in different countries developed automated inventory or data processing systems for museums. For example:

- 1964 the National Museum of Anthropology, Mexico started inventorying its collections on an automated system
- 1967 the Museum Computer Network, based at the University of Stony Brook was founded as a collaborative effort
- 1969 Italy, the Ministry of Cultural and Environmental Property started inventorying the cultural heritage in the country
- 1970 the Netherlands started documenting ship models in different maritime collections in the country

- 1972 the Canadian Heritage Inventory Network started as a centralised systems network for the whole country with institutions being able to choose options from a package financed by the Federal Government. (Roberts and Light 1980: 61-71; Sarasan and Neuner 1983: 5-8).

The above attempts to automate museum collection records are only a few of those which arose at this time. However all automation of museum records developed in response to the problems of large collections with manual systems which could not be properly maintained, nor could they meet the demands being made on them (Sarasan and Neuner 1983: 5-8).

In South Africa the profession was not untouched by these developments. In 1973 Prof. John Grindley, then Director of the Port Elizabeth Museum, gave a lecture on the computerisation of museum collections at the annual Southern African Museums Association Conference. As a result of the interest shown the Southern African Museums Association Computer Group was formally constituted at a meeting held in October of that year.

The initial aims of the Computer Group were :

- to investigate data management systems, including the setting up of pilot projects
- to investigate the availability of powerful computer facilities
- to focus the attention of funding bodies on the desirability of computer based data management.
- to investigate the cost of conventional museum data systems
- to develop recording standards for different disciplines
- to recommend or develop standard terminologies for use in different disciplines
- to compile a directory of collections by subject names of the collections and institutions
(Southern African Museums Association.Computer Group.Circular no.1 1973: 3-5).

In the late 1970's the Group attempted unsuccessfully to launch various pilot schemes to investigate data management systems. It then changed

its brief to disseminate information on developments elsewhere as well as co-ordinating and stimulating a study of museum documentation.

In the early 1980's various projects were launched :

- the development of Essential and Recommended Information categories in different disciplines for museum records
- a survey of the current state of documentation in South African museums.
- a national seminar on Museum Documentation held in 1983
- regular workshops on information and system analysis
- membership of the International Committee of Documentation

In 1983 the Group changed its name to the Documentation Group and became a Standing Committee of the Council. Prof Grindley served as Convenor from 1973-1979 and the author served as Convenor and later Chairman from 1979-1987.

In accordance with its declared purpose, the Group is serving as a focal point for stimulating interest in, experimentation with and finally the introduction of higher standards of collection documentation in Southern African Museums (Brain and Erasmus 1986: 30-31; Southern African Museums Association. Computer Group. Circular 1973: 1-5; Southern African Museums Association. Computer Group. Circular 1979-1982: 9-33).

3.3 THE MUSEUM INFORMATION SYSTEM

" There has been a dramatic growth in awareness of the importance of good documentation by museum curators in the last twenty-five years" (Roberts and Light 1980: 48). Roberts sums up the situation well when he says " In recent years there has been concern over the standard of existing collection documentation. Frequently it is found to be inadequate, being less detailed, less reliable and less well maintained than is desirable. Indexes if any, are incomplete, badly maintained and little used. Location details are cursory or out of date " (Roberts 1985: 17). Though the above refers to Roberts' experiences in Great Britain it is equally valid for South Africa.

For the purposes of this discussion the terms "museum information system", "information system" and "museum documentation system" or just "documentation system" should be regarded as synonymous. In museum literature the term "documentation system" is currently the most favoured, but because this author wishes to promote the concept of the total information system for the museum the term "museum information system" will be used.

An information system is defined as the total of all the procedures, methods and records which are used to make available to the user in answer to a query, all the information contained in museum collections or needed for curatorial purposes (after Brown 1976 :5; Harrod 1971: 329; Langridge 1973: 23; Roberts 1985: 25). The system must be able to deal with the documentation relating to the physical collections such as items, bibliographic, archival and audio-visual material as well as the information (associated and museological) relating to the collections and the cultural and environmental heritage of the community (Light, Roberts and Stewart 1986: 48; Roberts 1985: 25). It should include all the procedures necessary to facilitate

collection control, descriptive documentation, subject documentation and information retrieval (Roberts 1985: 25).

The scope of the museum information system has been fundamentally altered over the last ten years by the work of one organisation, namely the Museum Documentation Association of Great Britain. The traditional concept of a documentation system relates only to the documentation of items in collections. This has been replaced by a concept embracing collection and information documentation. Light (1986) and Roberts (1985), both employed by the MDA, call the latter support documentation. Collections documentation includes the documentation of both three dimensional items (collection items) and two dimensional items (bibliographic, archival and audio-visual material) from the museums collections. And support or information documentation includes conservation documentation, record photograph documentation, collection group documentation, corporate body documentation, event documentation and activity documentation. This emphasises the importance of different types of information in the museum and the need to make this data as readily available as that of the collections (Roberts 1985: 29).

The issue has been further complicated by the inclusion of bibliographic and archival material within the same information system. Museums do have collections of these materials as well, the implication being that in an automated system all collection records are within the same data base. The complication is caused by the standards for these materials which are compiled by bodies other than the museum profession. In South Africa the standards for bibliographic materials are maintained by the South African Institute of Library and Information Sciences and SABINET. The standards for archival material are maintained by the Processing Section of the Government Archives in Pretoria.

3.4 THE PURPOSE OF THE MUSEUM INFORMATION SYSTEM

The purpose of such a system is to :

- act as a repository of information about the collection and its environment, both social and natural

- to allow access to the collection and its information by exercising the control function already mentioned and ensuring adequate access points through indexes
- providing a surrogate for the collection in research and education

Within these very wide parameters it will include the documentation of all physical collections, both two and three dimensional and all information assets such as the details of conservation practices, record photographs and information about people, places, events or activities relating to the museum's community (Roberts and Light 1980: 44; Roberts 1985: 25).

3.5 THE FUNCTIONS OF THE MUSEUM INFORMATION SYSTEM

The functions of the museum information system are a practical expression of the aims expressed above. For instance the system assists in the :

- care and control of the collections by providing mechanisms and/or sources to help locate the items, manage internal movements, external loans, apply insurance and indemnification procedures,

undertake stock control, respond to audit enquiries, improve security, help reduce the risk of loss and maintain details of conservation (Light 1988: 48-49; Roberts 1985: 25).

- These tasks are linked to the purpose for which a collection is maintained in the museum and its management implications.

- aiding in the use of the collections by helping with preparation of publications and lectures, providing resources for research and assisting in the development of displays and exhibitions (Light 1988: 48-49; Roberts 1985: 25).

These tasks are linked to the educational function of the museum and its social obligations.

- aiding in the preservation of information, whether about items in the collection or of interest to the museum by providing facilities for its long-term storage and access (Light 1988: 48-49; Roberts 1985: 25-26).

These activities are linked to the preservation function of the museum.

3.6 THE PROCEDURES OF THE MUSEUM INFORMATION SYSTEM

In the past the procedures for museum documentation were brief and simple. They were usually :

- entry procedures (especially in history museums)
- accessioning or registration procedures
- procedures for the creation of a permanent record (cataloguing, descriptive documentation, or the creation of a record)
- the indexing procedures for the permanent record (indexing, classification, or subject documentation) (Allen, Owen, and Wallis 1960 : 40-51 ; Burcaw 1975: 84-92; Chenhall 1975: 13-18; Dudley and Wilkinson 1979: 3-198; Lewis 1976: 141-164 ; MacBeath and Gooding 1969: 49-58).

In broad outline these procedures include the following activities and the creation of the following records

3.6.1 Entry procedures :

Museums acquire objects by various means for incorporation into their collections: sometimes gifts from the public, loans from other institutions or requests for identification from the public. These procedures are a means of coping with the material and ensuring it is properly processed whatever the reason for its presence (Dudley and Wilkinson 1979: 13; Museum Documentation Association 1980d: 12).

Every item entering the museum should be properly receipted (Museum Documentation Association 1980d: 12), a temporary label attached to it and it should be entered in a register which records information such as the identifying number, date of receipt, from whom received (name, address and telephone number), purpose of receipt (gift, purchase, loan, identification etc.); a brief description identifying the item and any known historical information; the action taken, (including temporary storage location); accession number (if accepted into the collection); museum authority; and a signed statement by the depositor, accepting the conditions

of deposit (Dudley and Wilkinson 1979: 13-16; MacBeath and Gooding 1969: 50; Museum Documentation Association 1980d: 12-15)

The register used during the entry procedure may be a field notebook containing the field number and information gathered during the field trip, or a "day book" kept in the museum, often at the front desk (Allen, Owen and Wallis 1960: 40-44; Burcaw 1975: 84-86; Guthe 1970: n.p.).

3.6.2 Accessioning procedures

These are the procedures relating to the allocation of an accessions number to an item or group of items and the recording of the details of the number and the item in an accessions book or register. The details of the item are entered into the register, the number is attached or inscribed on the item, a form is completed ensuring that a transfer of title is effected and that the historical details of the item are recorded (Allen, Owen and Wallis 1960: 40-45; Dudley and Wilkinson 1979: 21-30; MacBeath, and Gooding 1969: 50-54; Museum 1980d: 15-20).

The accession number is a unique number which is assigned permanently to the item in the museum. It is the link between the item and its information, establishing the museum's legal right to the object and helping future management, control and utilisation of the item. It is usually composed of several different elements. It may be a straight serial number, or prefixed by the museum's code, either numeric or alphabetic, or it may be three part, consisting of the year, the month and a serial number (Dudley and Wilkinson 1979: 22-27; Guthe 1970: n.p.) The resulting number is known variously as the identity number, (Roberts and Light 1980: 46-47; Guthe 1970: n.p.), accession number (Lewis 1976: 143), or registration number (Burcaw 1975: 84). It is a permanent identity number and is usually assigned sequentially to the objects as they enter the collection. It is affixed permanently to the object and appears on all records relating to the item. (Roberts and Light 1980: 46-47).

The accession register is the book in which the number and the item information is recorded. It may be regarded as a minimum content record (recording the barest essentials of the information which accompanied the item) or a maximum content record (recording all known information about the item).

The categories of information which are commonly recorded are accession number, date received, from whom received, method of acquisition, basic identification and description, condition and disposal. Where the accessions register also acts as a locations list there is a category for location, storage or exhibition as well (Guthe 1970: n.p.).

The accessions register may be a bound book with rag paper leaves and each page numbered sequentially or it may be a file with each page typed in and a lock mechanism on the file to prevent pages being removed. The bound book is the preferred format (Dudley and Wilkinson 1979: 30; Guthe 1970: n.p.; Lewis 1976: 143-149). In small institutions the accessions register is frequently the only form of record-keeping observed. It acts as the total information system.

3.6.3 Procedures for the creation of a permanent record

A permanent record must be prepared for every item in the collection. It is the master record for information relating to the item, recording all that is known about the item or providing pointers as to where it can be acquired. The permanent record is

the primary source of reference used to answer enquiries about the collection (Dudley and Wilkinson 1979: 31-32; Museum Documentation Association 1980d: 20-23).

The creation of the permanent surrogate record is usually done under category headings within the four main types of information identified for museum records, namely identification information, inherent information, associated information, and management information. The requirements for each discipline are outlined in the Essential and Recommended Information Category lists promulgated by the Southern African Museum Association Documentation Group. The requirements of each discipline are different, hence the individualistic approach. (Southern African Museums Association. Documentation Group. 1987).

The information may be written up in manuscript onto cards or first written in rough and then typed onto clean record sheets or cards, or entered directly into the computer record (Burcaw 1975: 85-86; Guthe 1970: n.p.).

The item record is the permanent record of the item, recording "everything known about it, whether fact, tradition, or hearsay" (Guthe 1970: n.p.). In history everything about an object includes information about its production, people who have used, owned, or altered it, places where it has been made, used, sold, bought, or displayed, temporal associations of dates made, used, sold, and times of year when this occurred; detailed physical description, name and classification (Museum Association 1976a-1976h; Transvaal Provincial Administration 1974; Transvaal Provincial Administration 1977). For locality everything may include its number, location, physical description, a description of its importance, and related documents or items (Museums Association 1977, Southern African Museums Association. Documentation Group. 1987) For a document everything may include a standard bibliographic reference; its production, ownership, acquisition, physical description and an analysis of its contents (*Anglo American cataloguing rules* 1967) (Here after referred to as AACR 2).

The recording format used for descriptive documentation will reflect the decisions taken regarding the record content, identification, depth, order of data fields and form. It may be strictly

for internal use in one institution (Burcaw 1975: 91; Chenhall 1975: 8-9; Guthe 1970: n.p.) or it may be designed as a service to a group of museums (Lewis 1976: 150-156; Museum Documentation Association 1980c; Transvaal Provincial Administration 1977: v.1-5). The factors which should be considered during descriptive documentation are discussed in detail in Chapter 8: Descriptive Documentation.

Any system should make provision for the continued maintenance of the master record. Inevitably, new information will accrue to the item over the years.

It is essential that the master record should always be maintained as the primary up-to-date source of information about the item (Museum Documentation Association 1980d: 26).

3.6.4 Procedures for the creation of supplementary indexes

The final step in the documentation procedure is the creation of supplementary indexes or access points to the item. The type created will depend on the discipline concerned. It may be according to item name, subject, classificatory grouping, associated

information such as people, places, dates, or events associated with the item, or management information such as donor, or storage location.

Most museums with a manual system are restricted to preparing only three or four basic indexes, due to the high labour costs involved. The MDA recommends that an acquisition (donor) index, item name or classification index and a storage location index be regarded as the minimum requirements (Museum Documentation Association 1980d: 24).

For museums with access to a computerised system a wider range of indexes can be produced. The specific ones made will depend on the discipline concerned (Museum Documentation Association 1980c: 24). If the system is computerised, indexes can be produced at a very low cost: the number not affecting the cost (Cutbill 1973a: n.p.). For instance a history museum can have indexes to dates, localities, people or events associated with the item.

3.6.5 Exit procedures

And finally provision should be made in the museum's documentation procedures for items which leave the collection either temporarily or permanently. The

need for these procedures may be caused by the loan of an item to another institution, the loss of an item due to theft or destruction by natural forces, (e.g. insect damage), or its return to a former owner, all of which cause it to be deaccessioned (Dudley and Wilkinson 1979: 18-19; Lewis 1976: 133-136; MacBeath and Gooding 1969: 58; Museum Documentation Association 1980d: 32; Roberts 1985: 85-88).

3.7 SUPPLEMENTARY INFORMATION

The information system must also make provision for the preservation and access to other types of information such as confidential, transitory or just large amounts of additional information which cannot or should not be accumulated on the main record (Museum Documentation Association 1980d: 24-26). These may be housed in a separate series of files according to their nature e.g. confidential information files, loan files or additional information files (Dudley and Wilkinson 1979: 34-40; MacBeath and Gooding 1969: 54-56; Museum Documentation Association 1980d: 24-26).

3.8 CONCLUSION

In the past, surveys have revealed that many museums have only an accessions register, a few have catalogues of permanent master records and may have one or two indexes. Frequently these are not up to date, as Roberts (1985: 17) states "...for many collections there may only be one set of fading manuscript records, the security control over which may be superficial. Any indexes which have been prepared from these records may be incomplete, badly maintained and little used. The records may not have been annotated in the event of a loss, disposal or transfer of an item from the permanent collection. Location details may be cursory or out of date"

Museums are fully aware of the inadequacies of past record-keeping practice and are now intent on correcting the situation. But it is only now that general theoretical principles are being framed. To date only certain parts of this problem have been addressed.

CHAPTER 4

THE QUANDARY OF MUSEUM DOCUMENTATION

4.1 INTRODUCTION

The advent of automation excited the museum world with its possible applications. But failure of many of the early projects showed that there were serious problems inherent in the use of the "wonder machine" in the museum.

The greatest problem was that the museum fraternity had not looked far enough to see the background to the use of automation. No studies had been done to determine the exact nature of a museum documentation system, what was required of it or what problems would be encountered in achieving the desired end. Experience raised questions, highlighted problems and provided solutions.

At the root of all the problems is the museum's need for extensive output from an information system. But inherent aspects of museum records such as their very large volume and complexity have in the past been a hindrance in achieving this. Museums have a

relatively low item acquisition and movement rate (approximately 1% per annum) which does not encourage a major investment in automated entry, acquisition and circulation control systems (in contrast to libraries) (Roberts 1985: 16).

However, pressure for, inter alia :

- access to large numbers of inherited and undocumented collections (particularly in the U.K.)
- expanded education and research use of the collections
- accountability for collections in public institutions have forced museums to continue their attempts to harness automation successfully (Sarasan and Neuner 1983: 9).

4.2 FEATURES

The features which a museum documentation system should exhibit have been best summarised by Roberts and Light (1980: 45-46). In order to meet the needs of the user, whether it be the curator, researcher, or general public, the system must be able to accommodate a number of features.

It must be able to accommodate any number of records of any size. Museums vary in the size of their holdings from several hundred to several million. It would seem a pity to have to redo the entire museum's documentation at any point because the documentation system no longer functioned for the larger collections. The system should also be able to accommodate a record of any size. Some records are only a few characters in length while others are thousands of characters long. The system should also not require a large investment of staff time. Few museums have staff whose sole responsibility is the documentation system, so any system must be easy to maintain with a maximum return for a minimum investment of time and expertise.

This situation is definitely true at present although it is hoped that the continuing study of and publication about documentation in a variety of museum publications will raise the level of awareness of the profession as a whole regarding documentation. This should lead in time to greater demands being made on the documentation systems and pressure being created for specialised staff to deal with it. Such an important function should

definitely not be relegated to a minor position among the curatorial responsibilities, as happens at the moment.

It should also be easy to access the information required from the system and yet sensitive or confidential information should be protected. This can be done by placing such data in another record to which the public do not have access or by not allowing the public direct access to the documentation system, which would place a heavy service load on the staff.

The system should pay attention to the security of the data. There should be control measures which will prevent the removal of entire records or alteration of data on extant records. Again the method employed should not rely entirely on the integrity of one staff member only. Spreading the responsibility for data security makes it more difficult for falsification to occur.

In order to meet the museum's information need it must be able to provide information on a wide variety of topics and be able to cross reference between different types of data so that related material can be traced.

4.3 PROBLEMS

Over the years many problems have been identified in museum documentation which have greatly influenced the progress made towards automation, and the success of different projects. A number of features of museum documentation systems were not considered in the 1960's when automation of collection records were first initiated.

4.3.1 THE NATURE OF COLLECTION ITEMS

The most basic problem in an automated information system was provided by the collection items themselves, i.e. their uniqueness. (Roberts and Light 1980: 58). Items are collected as visible evidence of the natural or cultural environment of man, so that it is either the physical fabric which is unique, or the information associated with it, or both. This means that each item must be recorded separately. In the United Kingdom alone there are estimated to be over 500 million items in museums (Roberts and Light 1980: 58); in South Africa a very conservative estimate is 20 million items (Immelman 1984: 201). This is in contrast to the libraries which can consider co-operative cataloguing.

4.3.2 THE SIZE AND NATURE OF THE RECORDS

The nature of museum data has been studied and was found to be verbal rather than statistical, variable rather than constant and dynamic rather than static. Any documentation system must be able to support its complex and dynamic nature. (Roberts and Light 1980: 58). This is in direct opposition to what was expected. Museum records were seen to be static, because with manual systems the effort needed to effect changes discouraged one from starting.

The size of the individual records were also found to be a problem, because an item record can vary from 200 to 2000 byte. The large range in size of record and the dynamism of the record, which is an inevitable result of the upgrading of museum documentation practice, makes museum records very different from library records which remain stable once created (Roberts and Light 1980: 58; Roberts 1985: 17).

4.3.3 DISCIPLINE RELATED PROBLEMS IN DOCUMENTATION

The wide variety of disciplines found in museums present problems in documentation, particularly where an inter-disciplinary, multi-media information system is required. These problems are the same in all disciplines, but a varying extent of solution has been reached in each discipline, and with each problem. The problems are concerned with the classification, nomenclature and physical description systems used during documentation.

4.3.3.1 Nomenclature systems :

The nomenclature of museum items is one area in which problems occur because of a lack of standards in some disciplines. In the Natural Sciences the nomenclature of items is governed by the Linnaean system and the international codes in each discipline. Unfortunately there is no general, internationally accepted system of nomenclature in the Human Sciences. The publication of "Nomenclature for museum cataloging : a system for classifying man-made objects" by R.G. Chenhall (1978) and "Social History and Industrial Classification"

published by the University of Sheffield, Centre for English Cultural Tradition and Language are both brave attempts to fill this vacuum.

Individual attempts by institutions such as the Museum of English Rural Life at the University of Reading and the system used at the Pitt-Rivers Museum, Oxford or that of E.M.Shaw for ethnography used at the South African Museum, Cape Town are all possible solutions to the problem. These lists are for the internal use in the institution concerned and reflect the bias of their own collections. They are all lists of object types within certain classification groupings. While useful, they often prove difficult to transfer to other collections in other institutions.

The idea of lists of object names has been expanded during the last few years in projects which have arisen independently in different parts of the world e.g. USA, Norway, Italy and France. Object names are recorded along with pictures of the object, definitions or descriptions of the item and lists of synonyms. (Immelman 1980: 3; Light 1986: 233-256, 267-276).

4.3.3.2 Classification standards

The classification category of an item is, along with its name, the accession number and donor's name one of the most important access points in a museum information system. In the Natural Sciences there are internationally established systems which are closely linked to the nomenclature used and there are international bodies to deal with disputes and arbitrate on new ideas. In the Human Sciences no such generally accepted classification scheme exists, although the in-house systems already mentioned could form the basis of such a scheme. This question will be looked at in greater detail in the discussion on subject documentation. This is a problem to be noted.

4.3.4 MANAGEMENT PRACTICES

In the past the management aspect of documentation in countries falling under the influence of museum practice in Great Britain, was to have one person responsible for all aspects of a collection i.e. acquisition, research, documentation, and

interpretation. This frequently led to a very heavy load on the curator, which in turn affected the standard of documentation practice.

As collections grew the museum's documentation system often could not accommodate the increased number of records and needs of its users. Some features of the basic system were often abandoned, while new ones were added. The added features often reflected the personal research interests and tastes of the current curators in charge rather than attempts to design a consistent, cohesive system of documentation. As time went by the system often became so cumbersome that it could not be properly maintained. (Sarasan and Neuner 1983: 16-17).

In many museums a weak documentation system is not noticed because of a strong staff who have been there for many years and know the collections very well. For instance the precise location of a storage area is not written down because all the staff know where it is. Without the additional knowledge of staff the system does not lead a user to the item in a reasonable period of time nor does it interrelate or cross reference between items. This works as long as the information needs are low and there is little change of staff. The departure of staff often

results in a loss of the rationale behind filing systems, location of items and even collection information.

New staff are then faced with unexplained systems and handwritten records. They have the choice of either maintaining the inadequate systems or replacing them with new systems. (Sarasan and Neuner 1983: 17). The latter is often done and not completed due to pressure of other work. Therein lies the danger of redoing a documentation system.

4.3.5 PROFESIONAL PRACTICE IN MUSEUMS

Increased professionalism in museum practice has also stimulated the growth of a body of theory about museum documentation. The early documentation systems worked satisfactorily so no-one ever looked at them more closely. It was only when automation came into the museum that it was realised there were problems and a closer look was taken at aspects such as the underlying concepts of documentation, the units of information involved, and the need for vocabulary and syntax control. (Sarasan and Neuner 1983: 17- 20).

4.3.5.1 Data Standards

When museums first began computerising their records there was no general standard available for museum data. The information categories in each discipline were listed and the data entered accordingly, being linked where desired by the program. This was the approach used, for instance, by the Canadian Heritage Information Network (National Museums of Canada, 1977, 1978, 1979) or the Smithsonian Institute (Chenhall 1975: 93-95). This was the logical approach to use for a single institute or organisation. It was also the easiest.

In the United Kingdom a different approach was used by the Information Retrieval Group of the Museums Association which represented the documentation interests of a wide variety of museums and different funding bodies. As IRGMA could neither dictate the documentation practice nor the funding or facilities available to an institution an attempt was made to develop a multi-disciplinary, hierarchical data standard which could accommodate any type of museum record. This was considerably more ambitious than anything attempted up to that time. (Lewis 1977: 11; Museum Documentation Association 1980a)

The data standard defines the data categories and the relationship between these categories (Chenhall and Homulos, 1978: 205-212; Roberts and Light 1980: 47-48; Roberts 1985:43). The categories are grouped logically meaning that the links between them are implicit in the data structure rather than built into the program.

There may be a standard for each common type of information of interest to the museum e.g. object documentation, or locality documentation or separate standards may be adopted for convenient groupings of information such as individual disciplines or departments. The comprehensive data standard facilitates inter-disciplinary data manipulation, but it requires a greater degree of central co-ordination (Roberts 1985: 43).

The general data standard can be based on existing published documents such as the MDA Museum Documentation Standard for Object Documentation or the MARC (and the SAMARC) adaptation for bibliographic documentation. Each standard is then used for the relevant item records in the collections (Museum Documentation Association

1980a; International Federation of Library Associations 1980; Roberts and Light 1980: 47-48; Roberts 1985: 43-44).

The use of the data standard will ensure that the context of the data is retained, for example a date in an acquisition context is very different from one in a history context. Roberts (1985: 43) points out that a full data standard potentially includes hundreds of categories; that the system should not impose any limitations on the number of different categories allowed within a record and that the standard should allow for the addition of categories. The Documentation Group of SAMA has developed a proposed standard which is still being tested (Southern African Museums Association. Documentation Group 1987).

The next step in standardisation is to determine the data categories to be recorded for each discipline. Every project to automate museum records has forced the project leader to make lists of data categories which may be recorded for each discipline. An example are the listings of the Canadian Heritage Information Network (National Museums of Canada 1976a-1976e) or the record cards of the Museum Documentation Association (Museums Association

1976a-1976h, and Museum Documentation Association 1977). The MDA and CHIN listings form standards for these geographical areas.

The idea of a standard for information categories was re-inforced at the ICOM - CIDOC general meeting in 1978, which recommended that certain categories of information be regarded as the minimum which should be recorded (Olcina 1978: 218 -220). They are :

- Institution name (museum and country name)
- Accession or registration number
- Mode or method of acquisition
- Date of acquisition
- Source of acquisition
- Common object name (in local language)
- Classified object name and classification system
- Description

- History

This idea was enlarged on by the SAMA Documentation Group to derive both Essential and Recommended Information Categories for all the disciplines found within the Association. These were arrived at through the co-operation and with the consent of the specialist, discipline sections of the Association. (Immelman 1981: 13 - 23; 1982a: 11-19; 1982b: 8-12).

Apart from the disciplines found in the museum there are also bibliographic and archival materials for which the relevant standards have to be used. These standards already exist and where possible the museum should use them. For bibliographic material the standards of the South African Institute for Library and Information Sciences embodied in SAMARC and the Anglo American Cataloguing Code, (hereafter referred to as the AACR 2), 2nd edition, 1978, should be followed. SAMA Documentation Group refers interested members to these two sources and to the activities of SABINET (Wells 1979; International Federation of Library Associations 1980).

The standards for archival material can be taken from those used by the archival profession. (Evans M.J. and L.B. Weber 1985: 2v). In South Africa the Government Archives have developed an extensive system, the use of which is freely available to museums. (M.Olivier 1980: 28 - 33).

Standards for the so-called support documentation and information documentation such as locality or biography or event, have as yet received scant attention in museum literature although their importance is recognised (Museum Documentation Association 1980a; Roberts and Light 1980: 48; Roberts 1985: 44). It would appear that these data categories can generally be fitted into the existing data standards, according to superficial tests conducted by the author on the SAMA Data Standard.

In the final analysis the data standards that the museum adopts should be in line with the input and output requirements decided on by the institution. For instance if it is decided that the museum wishes to exchange information with other institutions it must see that its data is compatible with theirs.

4.3.5.2 Terminology control

A lack of the controls required by automated data processing in most museum information systems resulted in some of the problems discussed previously. In automated data processing there is a need to place constraints on the form and content of the data fields to make them more precise and consistent, to facilitate automated information retrieval. These constraints are called terminology control and can be divided into control of the form of the data field, called syntax control and control of the content of the data field, called vocabulary control (Museum Documentation Association 1980d: 52; Sarasan and Neuner 1983: 18). Non-application of these two controls in early projects resulted in museums finding themselves with masses of computerised data that are substantially unusable for data retrieval purposes because the data was not divided up into clearly labelled units which the machine could recognise when required to retrieve information. Some museums have been forced to start over, while others have spent large amounts of time and money attempting to reorganise the data into a usable form (Sarasan and Neuner 1983: 19).

4.3.5.2.1 Syntax control : Syntax control is the control of the order in which data elements in a field are entered. For instance, entering a personal name with the surname first, followed by the initials and the honorific.

The necessity for syntax control underlay the development of the so-called "common data categories" for the names of people, places, dates, dimensions, or documentary references which occur repeatedly in different contexts within the record. The SAMA Documentation Group has developed standards for the names of people, dates and locality recording within a record. (Locality records, per se, will include this information and further contextual data depending on the use made of them). These standards were accepted at the annual general meeting of the Association in Pietermaritzburg in 1987. (Southern African Museums Association. Documentation Group. 1987)

These internal syntax rules can also be based on published documents such as the standards of the International Standards Organisation for dates (ISO 2014, 1976) or the recommendation regarding the recording of bibliographic material in the AACR 2 (1978). The required standard form will probably

partly be determined by indexing requirements which place the significant part of the concept to the front of an index term so that it sorts into a usable alphabetical order (Roberts 1985: 46). The system should also be able to redisplay information according to the purpose for which it is required i.e. the order of information needed for an index will differ from that for a report. Because collection documentation has usually accumulated over decades and is not standardised, almost every data field would benefit from syntax control (Roberts 1985: 45-46; Sarasan and Neuner 1983: 19).

4.3.5.2.2 Vocabulary control : Vocabulary control is the control of the content of, or vocabulary used in each data field (Museum Documentation Association 1980d: 53; Sarasan and Neuner 1983: 18). For example the data field "method of acquisition" can be limited to two or three terms such as gift, purchase, bequest, or field collected (Sarasan and Neuner 1983: 18). Naturally, this is closely linked to nomenclature for objects, being the application of the same concept to all data fields on a record, not only the name of an item. This type of vocabulary control can be an institutional matter, shared among a group or promulgated by the national association. All these approaches have been

used in different parts of the world. The MDA, a national organisation, left the development of this type of vocabulary control to individual institutions. The areas where it should be instituted are indicated in the recording manuals, but the decision on what or how it should be done resides with each museum (Museum Documentation Association 1980d: 53). In contrast to this approach the Transvaal Provincial Museum Service, a regional organisation, clearly defines the terms that should be used. (Transvaal Provincial Administration 1977: v.2, 3, 4).

4.4 CONCLUSION

These problems have been identified through trial and error by the international museum community. The recognition of them has assisted the design of better systems since then. These later systems either take factors such as the complexity of the record into account or steps are taken to overcome them, for example the typology project of the Transvaal Provincial Museum Service.

CHAPTER 5

SYSTEMS AND SOLUTIONS

5.1 INTRODUCTION

The problems discussed in the previous chapter existed in museums long before documentation became an issue in museum practice, but they were unrecognised because the prevailing documentation methods were deemed satisfactory. Later when museums tried to automate their collection records, problems occurred because the museum world had not first examined and analysed the documentation system from a theoretical point of view. In attempting to solve the problems mentioned in the previous chapter it would have been of benefit to the museum world to have looked at systems theory first in order to realise the full implications of a properly developed documentation system.

A system has been defined as an assemblage or set of connected parts that work together to accomplish a unified purpose or objective (Kanter 1972: 14; Kirk 1972: 1; Ross 1970: 41). And it has four elements, input, processing, output and feedback (Kanter 1972:

14). A documentation system qualifies under this definition. However if the systems concept is applied to the museum as a whole it too is seen to be a system and the documentation system is but a subsystem within the whole, which affects every sphere of the museum.

In recent years there has been a tendency to view organisations as living entities which function according to certain systems, comparable to the muscular or veinous system of the body. The information system of the institution is such a system within the museum. (Bergengren 1978: 213; Cameron 1970/71: 15-17; Sher 1978: 133). It relates to the collecting, conservation, research and educational activities of the museum. An information system is always composed of subsystems relating to collection records, management, planning and fiscal control. The problems in early museum automation projects were experienced in exactly these areas.

It is postulated by the author that the documentation systems of old have become the information systems of the present in the museum which contribute to sound collections management. But as Homulos (1988: 47) states: " without a clear and precise understanding of the functions or

activities a system is expected to support it is unlikely that the system will succeed. It is equally unlikely that today's set of activities will remain unchanged over time".

A brief examination of the characteristics of systems might help one to avoid these problems in future. The characteristics of the museum information system can best be examined within the framework of the elements of an information system. i.e. input, processing, output, feedback and the systems characteristics which are its requirements and constraints.

5.2 SYSTEM ELEMENTS

5.2.1 INPUTS

The first element of a system is the "input" . This comprises all the external events which generate information relevant to the system. It covers both specific information fed into the system and any activities which are external stimuli associated with the system (Kirk 1973: 5).

The input in a museum information system is all the data relating to information units and to actual and potential activities which affect those objects (Light 1988: 49). The information may already be in the system, or it may potentially become part of the system, such as new data brought to light by research (Kent 1966: 24; Kirk 1973: 5).

The input process calls for the coding or formatting of such information so that the system can recognise and respond to it. The coding or formatting is a stimulus to the system. It must be done at source rather than left to intermediate aspects of the input system (Kirk 1973: 5). In the museum this means that the information must be formatted before it can be input, rather than input in an unorganised fashion. This was one of the early problems in museum computerisation.

The data input can be handled in a number of ways. In manual systems a form can be completed from which typed cards are created which can be duplicated to provide multiple access points. In an automated system a form is also used, either to be completed by the responsible officer in manuscript and input

by a data typist or input directly with the form being the input screen in an on-line system (Lewis 1976: 150; Kent 1966: 30-79).

In early automated systems in museums, insufficient attention was paid to the output requirements, which are necessary for determining the input, the manner of organising the data or the methods which exist to streamline data entry and substantially reduce the time and cost for inputting. Some museums have an entry rate of 30-40 records an hour with 70% accuracy while others have rates of 150-250 records per hour with 99% accuracy using automated input techniques (Sarasan and Neuner 1983: 29).

5.2.2 OUTPUTS

The output of a museum information system is the information required for curation or control purposes which it provides for the user (Light 1986: 1; Roberts 1985: 25). The output sought will vary from answering queries from staff and public to seeking actual information. All are met by accessing the information contained in the record. This information is accessed in different ways according to whether a manual or an automated system is used.

Two basic techniques are used to access the information, namely cross references and indexes (this term is used very loosely to mean an ordered sequence of catchwords). Cross references are a useful technique for interrelating separate files or entries in a manual or an automated system. These usually take the form of "see" or "see also" references (Kent 1966: 108 -109).

To function efficiently the cross references between files and their contents should be complete. Data referring to the same object should be consistently recorded in all the applicable files. When data are changed they should be changed everywhere they appear, not just in the main record and this can most efficiently be done in an automated system. (Roberts 1985:40-43).

Sarasan and Neuner found in an investigation of museum automation projects in the USA in 1982 that the network of cross references had broken down in many manual systems, if it had ever existed. (Sarasan and Neuner 1983:19). Exactly the same situation can be seen in museum information systems in South Africa (Immelman 1984: 202-203).

Indexes are created in a number of ways, mainly through the use of catchwords which are then incorporated into the record according to different methods (Kent 1966: 108-109).

The need for a wide range of entry points relating to a single record remains a basic problem in museum documentation. Questions asked of the documentation system do not fall into a small number of clearly defined types, answerable by a few indexes or catalogues. (Roberts and Light 1980: 58). For Human Sciences collections it varies between 10 and 15 access points per record (M.Schulze 1986: pers.comm.).

In manual systems indexes or access to the record is created through a network of additional and analytical records which are organised in a variety of sequences such as classified, alphabetical or dictionary arrangements in an information system, devoted to a single type of collection e.g. amphibians or a type of entry, e.g. donor, or a multi-disciplinary information system in one sequence. (Chan 1981: 77, 97). But no manual system exists with, for example, the ten or fifteen index entries per item, mentioned above. (Roberts and Light 1980: 58; Roberts 1985: 53).

The creation of different indexes in an automated system is an easy task which can be done automatically. Cutbill (1973: n.p.) found that the ease with which an automated system created indexes made it cost effective for use in a museum context because it allowed better access to the collections and therefore better use of them.

However on the question of system outputs it must be emphasized that the institution's requirements will be related to the disciplines represented in its collections and the institution's own situation (e.g. public or research institution, collection policy, educational activities and so on).

5.2.3 PROCESSING

The existence of a system presupposes that something will be done according to set methods, with the information entered into the system (Kirk 1973: 2). In the museum these methods will be the instructions for manipulating the information in the system to produce the desired outputs for curation or control of the collections and execution of the museum's activities.

The procedures in the system will combine and manipulate the input and the existing data base to achieve specified results or outputs (Ross 1970: 188). In the museum information system Roberts (1985: 34-34) distinguishes between initial processing operations and subsequent processing operations. The initial processing operations are :

- recording information when creating a new record or supplementing an existing record
- entering information into a computer based system
- editing information to correct errors introduced during recording and data entry
- validating information by comparison with standard terminology lists.

While the subsequent processing operations include:

- manipulating input information into a standard format
- merging new records with existing records to produce an updated main file

- modifying the records in this file to produce an updated main file
- inverting new records to produce entries suitable for incorporation into index files or printed indexes.
- retrieving information from the main or index files
- sorting primary records, index entries and retrieved information into standard sequences
- displaying sorted records, index entries or retrieved information on record or index cards, computer terminals microfiche etc.
- maintaining and storing secure copies of the main and index files for long-term preservation
- transferring information from the main files to other parts of the system or other systems.

Procedures must be established to deal with both routine and anticipated non-routine occurrences (Kirk 1973: 2). They must also be flexible enough to accommodate new systems that may arise as a result of new problems (Ross 1970: 188). Procedures may include programming, creation of the record, systems design, equipment set up, clerical operations and man/machine interactions (Kirk 1973: 2).

5.2.4 FEEDBACK

The information system should always have a feedback/control mechanism built into it which will evaluate the performance of the system against its stated objectives. This will enable the system to be self-correcting in the face of changing circumstances. (Ross 1970: 8). The feedback/control system collects, analyses, stores and displays information required by people at different levels in the organisation and outside it for different purposes. The museum information system is unusual in that outsiders are not usually given access to information in an organisation's information system. The feedback/control mechanism will show both the successes and the failures of the system. It can be used in planning (Ross 1970 :101).

Control is defined as the system function that compares output to a predetermined standard, while feedback is the function which provides information on the deviation between output and the control standard and delivers this information to the responsible manager (Ross 1970: 183). Roberts (1985: 96-98) is the only writer on museum information systems, known to the author, who refers to control in relation to the museum information system. He saw it chiefly in relation to inventory control and location control. This is yet another aspect of the information system which usually receives scant attention in internally developed museum information system.

5.3 SYSTEM REQUIREMENTS

These are the factors which must be present in order for a system to exist in an institution. They can be divided into the informational system requirements, the managerial system requirements and the physical resources.

5.3.1 INFORMATIONAL SYSTEM REQUIREMENTS

Informational system requirements are the information itself and the data base which organises it for the institution. Information is the single most important factor in an information system (Ross 1970: 89). Without it there would be no information system.

Information is any item of knowledge that is considered useful or worthy of retention, is recorded, housed and arranged so that it can be communicated and used at a later date (Kent 1965: 21; 1966: 19; Orna and Pettit 1980: 3). From this can be deduced that the information in the system should be structured so that it can be organised and retrieved (Ross 1970: 189).

The information in the system will be derived from the collection items, the museum's cultural and environmental surroundings and the activities which cause interaction between the two. Information from both internal and external sources must be accommodated (Kanter 1972: 11). A record should also be kept of all activities performed on the data (Light 1988: 51).

Apart from information the other informational requirement of the system is a data base. The information is held in a common store which is called a data base or data bank. It is a unified collection of structured information which can be utilised by different departments and people for different purposes (Kanter 1972: 12; Ross 1970: 159). Kirk (1973: 4) defines a data base as a logically organised arrangement of semi-permanent, fairly accessible information which can be made available either manually or mechanically.

The concept of a database is usually a collection of all an institution's information held in one place, so that duplication and redundancy are avoided (Kanter 1972: 60; Ross 1970: 159). Information concerning on-going activities is captured once, validated, and entered into the proper location in the data base which avoids the creation of separate but duplicate records at different points in an institution when different activities use the same data (Kanter 1972: 60). Different subdepartments can be linked to the common information store drawing from it only what they require e.g. the researcher

on a museum collection will require different information from the record to the conservator or clerk recording loan transactions.

The museum has the choice of having an integrated, multi-media, interdisciplinary data base for all its collections or establishing separate ones for each discipline or department. It is a policy decision which will influence the form of information system developed (record type, recording media, hardware, software, and so on).

5.3.2 MANAGERIAL SYSTEM REQUIREMENTS

In an information system there are certain facets which can be called the managerial aspects, which will affect the design of the system. The managerial requirements are the objectives of the system, the activities it is intended to support, the communications media use, the dynamism of the system and finally the organisational structure used to support the systems objectives and activities.

5.3.2.1 Objectives

It is essential that the purpose or objectives of the information system are clearly stated. It has been phrased as "to provide each user with the information needed in a usable form when it is required" (Ashworth 1976: 35). The more precisely the objectives are stated, the more effective will be their implementation (Kirk 1973: 2). A lack of clearly stated objectives has frequently been a major cause for failure of systems (Ross 1970: 274). This in fact was one of the major stumbling blocks of early museum information systems (Sarasan 1981: 49).

For museums then, if one accepts the objective presented earlier by Ashworth (1967: 35), the objective of the museum information system is service, although it can also act as a control mechanism in the use and care of the collections (Roberts 1985: 1).

5.3.2.2 Activities

The activities that the information system should support have been phrased by Roberts (1985: 25) as assisting in the curation and control of the collection and its information. Couple this with the service mandate discussed previously and it is seen that the system should help the user to :

- ascertain the museum's holdings when an item or information is sought under a general or specific name
 - enable the user to find the information unit either in a reference to its source or a storage location
 - assist the user in the choice of items for display, education or research regardless of whether these are sought according to their physical nature or associated information.
- (Roberts and Light 1980: 44; Light 1986: 48; Roberts 1985: 25).

The system can also assist in :

- establishing the legal ownership of the item
- controlling its movements within the museum
- meeting the museum's obligations of accountability
- recording the history of an item's use in the museum

(Burcaw 1976: 84; Chenhall 1975: 17; Dudley and Wilkinson 1979: 21; Lewis 1978: 150; Roberts 1985: 25-26).

From the above it will be seen that the information system is expected to serve as an inventory of collection, a finding list for locating collection items and a research tool.

Within the rich variety of museums extant in the world these activities take on particular nuances peculiar to each type of institution. Samples of these activities are included below .

In the natural history museums the activities which require information are :

- control of the collections within the museum
- the preparation of environmental impact assessments (Chenhall 1975: 17)

In a history museum the information requiring activities are :

- control of collections within the museum
- ability to locate the records of specific objects
- creation of lists of items by storage or exhibition location
- summarised information for audit or insurance purposes
(Chenhall 1975: 17).

In an art museum these needs are:

- to trace the works of one artist

- to link biographical details to art work
- to find material for arranging special exhibitions
- to define works according to medium, subject, or locality (Vance 1970: 206).

It will be necessary for the museum to have support systems such as finance, staff, equipment and procedures in order to achieve this.

5.3.2.3 Communication media

An important part of any information system is how information is placed in the system's "memory" and how it is obtained again when required. This is the "communication" aspect of an information system (Kanter 1972: 158). A system must be able to receive and transmit information both internally and externally so that the required information can be imparted to the user when required (Kanter 1972: 158; Kirk 1973: 3).

The communication system consists of the communication media used at input and output and the linkages between them. (Kanter 1972: 158). The

communication media are the various physical media used to communicate information at both input and output, such as printouts, cards, type, spoken words, signals, or lights (Kirk 1973: 4). The input medium in the museum is usually a card, form or keyboard, while the output medium can be punched or magnetic tape, print-out or VDU (Kent 1966: 43-60, 86-103).

The linkages between the input-store-output sequence can be manual or electronic. In a manual system the means used to arrange the input units are usually called a filing sequence and may be alphabetical or systematic (Wynar 1980: 480-485). This is discussed in greater detail in Chapter 8: Descriptive Documentation. But whichever method is used its primary purpose is to ensure the easy retrieval of information.

In an electronic system the linkage is provided electrically (Kanter 1972: 158). The communication linkages form a network which ties the different parts of the system together (Ross 1970: 67). In large organisations the information needs are often complex and decentralised, both geographically and hierarchically. It is frequently an objective of the information system to integrate these diverse

aspects of the organisation into a cohesive whole through the sharing of information. Integration of parts or functions of an organisation to each other and to the whole is a vital aspect of the systems approach in any museum (Ross 1970: 244).

5.3.2.4.Organisation

The design of an information system should be integrated into the structure of the organisation it is intended to serve. Not only should the information system itself have a well-thought-out structure, but it should be placed within the structure of the organisation so that the right information is available to the right staff at the right time (Ross 1970: 189).

Firstly access to information in the system should match the organisational and hierarchical staff structure. For instance the clerk in charge of loans should not necessarily have access to the price of an item while the director should not find that he cannot obtain the information needed for fiscal control or planning. (Ross 1970: 189). Each level of the organisation requires a different type and degree of detail in order to execute their tasks.

Secondly the information in the system should be structured in such a way that it reflects the levels of management and hence of detail required. (Ross 1970: 189). Three levels of management are recognised, top, middle and operating, each of which requires specific types of information. Top management are the director and heads of department in a large museum, or just the director or curator in a medium sized institution. They determine the long and short range objectives of the organisation, plan and apportion the monetary, physical and personnel resources (Kanter 1972: 180).

In the museum the information systems are still concerned more with the details of item description than with the possible use of the system by top management. However, a well designed information system would ensure that the top management is immediately aware of changes in, for instance, the collection growth rates in a department because this will affect accommodation and finance; or differences in the type of collections being accrued as this will affect policy, research and service objectives.

The middle management are the senior personnel within any department in a large museum. They must translate the objectives framed by top management into specific plans and see that they are carried out (Kanter 1972: 4). Control is a predominant activity at this level. Middle management will use the information system to see that the collecting policy is adhered to, that the research goals are achieved and that fiscal policy is implemented. All these aspects can be assisted by a well designed information system.

The operating management are the professional and technical staff in the museum who translate the specific goals and programmes into finite and specific activities (Kanter 1972: 5). They require specific and exact information from the information system (Kanter 1972: 9). It is likely that operating management will make the most use of the information system to provide them with specific information on collection items and the activities in which they have been used. (Kanter 1972: 9; Light 1988: 53).

The establishment of an information system in the museum must also be accompanied by changes in the organisational structure of the institution if it is truly to function as a central database for the

whole organisation. In the United Kingdom and areas of British influence e.g. old colonies, documentation has never been considered a central function of the museum such as collection or education. However in the USA the existence of a central registration department appears to be the norm (Dudley and Wilkinson 1979: 3).

But this is changing in the United Kingdom. The MDA strongly advise the establishment of a central unit to implement policy and control the information system (Light 1979:pers comm; Roberts 1985: 37). This idea is obviously finding favour because several museums are changing their organisation to place the collections management department and the information system on a par with the research departments (Ormond 1988: 111-115). This trend has also appeared in Australia (Esau 1988: 153-156; Welkamp 1988: 157-166) and in South Africa (M.Holscher 1989:pers comm.). These changes all emphasise that the organisational structure of the institution should acknowledge the importance of the information system in its functioning.

5.3.2.5 Dynamic nature

The single most important requirement of a system is that it must possess the ability to withstand or adapt to change be this, in the environment (planned or predicted; from outside (through laws, and regulations) or internally (as a result of new objectives, management, decisions, changes of equipment or personnel) (Kirk 1973: 4). The investigations of museum information systems conducted by the MDA has shown that they are and must be dynamic (Roberts and Light 1980: 45-46). This natural dynamism is proved by the fact that they continue to exist despite radical changes to their form and content caused by automation.

Roberts and Light (1980: 45-46) state that dynamism is an essential feature of the system in that it must be able to accommodate records of any length, that they must be able to accept additional data and that the system must easily accommodate new records.

5.3.3 PHYSICAL SYSTEM REQUIREMENTS

Finally there are certain physical resources which must be present in order for an information system to function. These are money, manpower, materials, machines and facilities.

5.3.3.1 Finance

Finances are at the heart of any operation where income and expenditure must be balanced. However one is concerned in the museum with the monetary value of information: it is the one serviceable commodity which museums are not exploiting at all. Despite the growing importance of information there is as yet no set of principles by which to balance the cost of acquiring, storing and organising information against the value of using it, particularly in a service situation. (Ross 1970: 189). Neither is there a method available for comparing the cost of information against the value received from considering additional courses of action as a result of the availability of information (Ross 1979: 189-190). Nor has new knowledge resulting from research yet received a price tag.

In establishing a museum information system there are certain costs which cannot be avoided. They are :

- the cost of acquiring data
- the cost of maintaining data
- the cost of accessing data

(Kanter 1972: 12).

Since museums are wholly or partly publicly financed their development will always be affected by restrictions on central or local government spending (Orna and Pettit 1980: 36). The chronically low state of museum finance affects two aspects of any project to improve the information system. One is the budget available for the project and the other is the salary which can be paid specialist staff (Sarasan and Neuner 1983: 30-31).

Museum budgets cannot compete with salaries in the private sector and so the museum cannot hire either the number or quality of staff needed . This factor directly affects the quality of the resulting system and is particularly important when the complexity of museum data is borne in mind (Sarasan 1981: 45). The actual budget, apart from the salaries means

that the museum faces formidable constraints in developing an automated documentation system. Some funding from outside sources is available but the low level of funding means that museum projects are very susceptible to the effects of inflation, personnel turnover or judgement error. Because museums have budget limitations they have a tendency to look for bargains which can be disastrous in automation. The importance of quality in both people and equipment for a successful project should not be minimised (Sarasan and Neuner 1983: 31).

The personnel costs referred to include the hiring of experts to set up the system, possibly new staff to enable the museum to meet different requirements, and the training of existing staff to use the system properly. (Sarasan 1981: 45; Sarasan and Neuner 1983: 30-31). The costs of extra staff such as that employed during the implementation phase of automation to input the backlog of the previous documentation system, should also be borne in mind.

In museums an unanticipated cost of even a relatively minor nature cannot easily be absorbed. It may cause delays or even halt the project.

When considering the financial aspects of the information system, the planning should be able to state in clear financial terms the implications of the following :

Development costs

- the costs of planning the new system
- the cost of obtaining the required expertise
- the cost of the required equipment
- the cost of training staff

(Roberts 1985: 151)

Cost of acquiring the data

- how much data will be acquired ?
- will only current data be input ?
- will a programme be launched to capture data retrospectively ?
- who will do it ? (salary implications)

- how will it be done ? (equipment implications)

Cost of maintaining the data

- how will it be maintained ? (equipment implications)
- who will be responsible for maintaining it ?
- how will the maintenance be organised ? (staff and organisational implications)

Cost of accessing data

- who will have access to the data ? (staff and maintenance considerations)
- how will it be done ? (equipment)
- who will pay for computer time used during operation ? Will the individual departments be allocated an extra sum above their normal budget or will they have to meet it out of their existing funds; or will they be charged at all ? (Kanter 1972: 12; Roberts 1985: 142, 143, 151; Squires 1970: 50)

Other problems which will also influence finance are :

- who will determine the priority of requests for computer time and assess the cost of such requests ?
- how will it be decided which requests should be processed with which funds ?
- will visitors be assessed for the costs of enquiries ?
- to what extent are visitors given free access to the computer facility ?
(Pettit 1979: pers. comm.)

A change in system will also require a change in budgetary procedures when compiling the estimates for future years as new and different materials will probably be used. Account should also be taken of the effect a new system will have on the functioning of the museum. For instance a documentation system which can provide new facilities will mean an increase in the use of these facilities and probably a demand for others. In an automated system this will be reflected in greater computer operating

costs or the need for extra staff to provide these services. All these extra costs could well make traditional manual methods the only type of system which the museum could afford.

5.3.3.2 Manpower

People are the most important resource in any information system (Kirk 1973: 1; Ross 1970: 190). People recognise the need for a new system, develop and implement it. The need for any information system springs from the problems and requirements of people within the organisation and should achieve for these people the results they desire (Kirk 1973: 1).

Problems are no respecters of lines of organisation, authority or departmental jurisdiction, therefore the people involved in the development of the information system should be drawn from all departments and levels of organisation. They must work as a team, on an integrated basis to achieve the result desired (Kirk 1973: 1). The success or failure of a system is often determined by the people in it and their attitudes. It is essential that the administration and top management of the museum support the project since a negative

attitude at this level will affect all the staff and serve as a deterrent in the development and excellence of the system developed (Kirk 1973: 25-30; Sarasan and Neuner 1983: 13-14).

Ignorance on the part of museum staff, of technology, information science and systems analysis in the past has led the museum world to make mistakes and experience problems in the automation projects which have been undertaken, and which could have been avoided (Sarasan and Neuner 1983: 12). For instance this ignorance led to the investigation of the nature of museum data only in the late 1970's, nearly 20 years after the first projects were started. (Sarasan and Neuner 1983: 12; Roberts 1985: 37-38).

Part of the sensible planning for an information system is to study the personnel needs of the system at different stages of the development e.g. planning, implementation, maintenance and operation (Kirk 1973: 147). There are several different groups, of people who will be connected with the information system at each of these stages.

The planning personnel are the following people :

- the director to represent the top management and provide the team with the necessary insight into the other objectives of the museum and the financial possibilities of the organisation
- the assistant director and other senior professional personnel who see the proposed system in terms of their needs. The definition of these needs at this stage will prevent problems at a later stage.
- an operational specialist such as a work study person who can see the requirements of each member of the museum team in terms of the system as a whole without being biased. Such a person should be an outsider who can act as a catalyst in discussions. He should have a good knowledge of computers, information systems and data processing and be able to see the problems in terms of hard and software available.
- when the decision is taken to computerise a computer specialist should join the team to advise them on what is possible and how it can best be achieved.

The project team will formulate the broad framework of the system, framing policy within the constraints of the institution concerned. An investigation of this nature should draw directly and indirectly from all levels of staff affected by it. (Toney 1988: 82).

The development personnel will be the curator and a systems analyst. The curator will formulate his needs and the systems analyst will study these in order to pin point the information needs and data processing requirements of the institution. From his conclusions he will design a data processing system, prepare the specifications for it and a broad outline of the system (Orna and Pettit 1980: 130-132; Toney 1988: 83).

The implementation staff are those who put these ideas into practice. On the computer side it will be the programmer who will write the computer programs based on the specification prepared by the systems analyst and the computer operator who will operate the keyboard of the computer console and key the information in (Orna and Pettit 1980: 34; Sarasan and Neuner 1983: 12). On the museum side will be the

curator and any assistants he might have who are responsible for writing up the information in a manner suitable for input.

Sometimes the museum will bring in a team from outside to prepare input for the information system and reduce the backlog. This team then moves from department to department helping where required. The Smithsonian Museum did this for their pilot project. It helped in the rapid creation of a database. In the United Kingdom finance was available for a few years to employ people temporarily and many museums used them to rapidly reprocess old collection documentation. Though they were all inexperienced the results of employing temporary staff for retrospective documentation, were similar to that of the Smithsonian, highly successful.(Light 1986: 127).

Finally the continuation and maintenance staff are those people responsible for the information system on a day-to-day basis. As already suggested they should form a separate department, with the necessary staff complement to function effectively.

Frequently the same staff are expected to fulfill all these roles without any outside help. This is not realistic as different skills and inputs of knowledge are required at different times during the process of planning, developing and implementing such a system while there should be one or two people involved in all phases, who form the core of the staff involved in documentation, others should be brought in as required to contribute extra expertise (Chenhall 1975: 235-241; Kirk 1973: 47; Roberts 1985: 37-38, 191-194; Sarasan and Neuner 1983: 11-12; Squires 1970: 43-62).

5.3.3.3. Supplies

The supplies needed will include stationery, hardware, software, facilities such as the building which must be available when required for the system to keep on schedule. This was particularly important in sanctions prone South Africa.

5.3.3.4 Equipment

The equipment needed to run the documentation system can vary from pen and paper in a manual system to sophisticated electronic data processing equipment in an automated system. It will also include the

equipment used in the physical description of the item such as tape measures or callipers. The term "equipment" will include all devices or machines that contribute to a stipulated result (Kirk 1973: 2; Ross 1970: 188). It will include anything and everything directly related to achieving the system objectives (Kirk 1973: 2).

The modern catalyst in improved information systems is the computer and its related equipment. Design of the system must take account of the economic utilisation of the equipment (Ross 1970: 188). It may be either a manual or an automated system (Orna and Pettit 1980: 76).

A manual system will usually be based on some type of cards: plain, preprinted, edge notched or punched, being arranged according to item or feature. (Orna and Pettit 1980: 77-84). Even a word processor with its multiple duplication facility should be considered (Orna and Pettit 1980: 85; Sarasan 1981: 48).

Computers are seen as the "wonder machines" of the twentieth century and automation of the information system will be of considerable assistance to the museum in helping it to achieve active and economic

use of the collections (Orna and Pettit 1980: 88). The basic components are the hardware (including input and output devices, a central processing unit and storage facilities); the software; the data and the staff. (Roberts 1985: 137).

The museum is faced with a choice of hardware which can be acquired, namely a mainframe, mini-micro processor and word processors (Roberts 1985: 137). It is also faced with a choice of how to acquire access to the hardware. It can :

- buy it outright from the manufacturers. This is extremely expensive and not often recommended as the models improve so rapidly
- hire it from the manufacturer or computer consultants. This is often recommended as the firm is responsible for upkeep and the museum can easily change the model for a more modern one. Financially this looks very expensive but the service rendered and the use of the latest models makes it financially viable.
- make use of a facility close to hand, often within the same financing body. Some museums have used the computing facilities of a

neighbouring university. e.g. Manchester Museum which is part of Manchester University uses the university's facilities (C.Pettit 1979: pers.comm.) or Albany Museum in Grahamstown which uses Rhodes University Computer Facilities (they are in the same town) (W. De Klerk 1985: pers.comm.). Other museums use the facilities of the local municipality, particularly when they are a department within that organisation.

When using the facilities of neighbouring organisations which offer the use of their facilities at a very low rate, one should be aware of the possibility that they will come under pressure in the future to charge realistic tariffs for them. This happened to several museums in the USA which automated their collection records using the facilities of a neighbouring organisation at a low tariff. Tariffs were increased to a realistic level and the museums who could not afford them were left with severely curtailed access to information which had been automated in the first place in order to increase access to it (Sarasan and Neuner 1983: 28).

The software part of the equipment equation has caused innumerable problems to museums. In early automation projects museums wrote their own software because there was nothing suitable on the market. Other museums then used these same programs, because museums are conservative institutions which are more likely to follow each other than experiment. The result of this is that many museums are still using first generation programs which do not provide the features which later became standard (Sarasan and Neuner 1983: 28).

Financial considerations have also frequently led museums to try and develop their own software because of the high costs of commercially available software packages. This was false economy in the long run, as the hidden costs of developing their own software makes commercial packages economical, even though there is a high price tag attached to them. Orna (in Orna and Pettit 1980: 94) strongly recommends that commercial software packages be obtained and applications for the museum written on them.

Injudiciously selected or developed software often caused one of two major problems :

- all the data could not be retrieved from the large data files created
 - the program might be so inefficient that high costs were incurred even for simple queries.
- (Sarasan and Neuner 1983:28; Williams 1987: 39-74)

Suitable commercial packages for museum use are now obtainable from vendors such as "Stipple" from Erros Computing Services or Modes from the MDA or TINmus from IME Ltd (Roberts 1988: 229).

These physical resources determine the environment within which the other requirements and constraints operate, for without this environment they could not operate at all.

5.4 SYSTEM CONSTRAINTS

There are several factors which limit or constrain the information system.

5.4.1 FINANCE

The finances available to the institution will determine the type of system to be designed for it as well as influencing all other consideration.

5.4.2 SECURITY

The need to ensure security in the system and in the information it manages is of paramount importance to the museum and its endeavours to develop a service through the provision of information. Three types of security should be catered for :

- general systems security such as the provision of backup staff or equipment in case of a failure
- physical security such as building security or restriction of access to certain people
- data security ensuring there are duplicate records and the maintenance of data recording standards

(Orna and Pettit 1980: 43; Roberts 1985: 38-39).

5.4.3 CONTROL

There is a need for control in any situation where men work together towards an objective. Interaction between men, machines and procedures takes place constantly in any system and this interaction must be checked (Kirk 1973: 6). Control is therefore one of the requisite features or characteristics of any effective system (Kirk 1973: 6). It is a regulatory device.

A control mechanism must be built into the information system to ensure that deviations from the established norm are corrected as soon as possible (Ross 1970: 98). The objective of control is to maintain the output that will satisfy the system requirements (Ross 1970: 97). Control has three components, namely:

- setting standards of performance
 - measuring performance against the standard
 - correcting deviations
- (Ross 1970: 113).

To be effective control must be exercised over many system characteristics. Control comprises a series of internal, predesigned criteria incorporated within the stated objective and design of the system (Kirk 1973: 6).

Roberts (1985:96-110) identifies several different types of control which are necessary in a museum information system. He mentions :

- inventory control: the creation and maintenance of inventory controls for the collections
- location control: procedures for the maintenance of methods of tracking the location of items in the museum
- collections control: procedures to ensure the interrelation of all records affecting control of collections, be they acquisition, location or inventory control
- retrospective control procedures; the entering of retrospective information into the system and controls to ensure its accuracy

- control of non-acquired material: procedures to ensure a paper trail for items which both enter and leave the museum (items are sometimes offered to the museum for its collections, but not accepted, in which case they must be traceable.
- initial control of acquired material: procedures to ensure a paper trail for items from the moment of their entry into the museum
- item record control: procedures which determine the creation and content of the item record and the standards to which it is done and checks on those standards
- movement control: procedures to trace the movement of items both internally and externally
- deacquisition control: the procedures which enable control to be exercised over the records of acquisition of material.

These controls are all governed by procedures which must be maintained in order to be effective and must be performed to the standard determined.

5.4.4 LIMITATIONS

Every system must have defined areas of applicability, limits of interest and activity. These limits are the boundaries or parameters of the system. Systems in an institution may complement each other, be closely related or even interlock at times, but each must have its own specific limits for specific situations. For example the system for the documentation of collections is closely related to the system for the educational use of the collections but the focus of each system is different, and will be defined by the objectives and policy statement for each system.

5.5 CONCLUSION

These requirements and constraints operate in all systems, and the museum information system is no different.

CHAPTER 6

PRINCIPLES AND A CODE

6.1 THE CONCEPT OF PRINCIPLES AND A CODE

The library, archives and museum all see themselves as institutions which provide the community with information at different levels and in different ways. The information system is central to these services because it shows the institutions holdings (Landau 1966: 90). In the early days each institution constructed its own information system in the manner deemed most suitable for its purposes. Records were presented in forms and styles that varied from institution to institution (Chan 1981: 11).

It is also unfortunately true that different people will describe similar items differently although quite accurately. The same person may even describe the same item in a different manner on different days: the result is inconsistency in the information system and uncertainty on the user's part about the

accuracy of the information system records. To obviate inconsistency and its resulting user uncertainty as to where information can be found in the system, a measure of uniformity and standardisation must be established.

Any system is created to achieve a certain end, and when more than one person works on it, it is best if the method used is carefully spelt out. This will assist all concerned with the creation of the system to achieve a certain level of standardisation if the system is to function properly. When more than one institution contributes to the same system it is even more essential that the rules are clear and concise. Formulating rules with which everyone is happy, is very difficult. This task is made slightly easier if there is agreement on the principles which underlie the rules.

Agreement on the principles will make the exchange of information between departments in one institution possible and the exchange between different institutions on a national or international basis possible. A code and principles facilitate the international communication of knowledge by achieving the widest possible uniformity of records and information

systems. This makes it possible for records pertaining to different types of materials and drawn from different types of institutions to be compatible and included in the same information system. The standardisation of cataloguing practice became necessary in the library world to make national and international data bases function correctly.

The answer lies in having a commonly accepted framework of principles which can be used in the construction of rules (Lubetzky 1969: 1). Such a systematic framework of principles is called a code (Webster 1974: 216). According to Lubetzky a code should be an outgrowth of:

- "a searching inquiry into the purposes which the information system should be designed to serve
- a systematic analysis of the problems in creating such a system
- a definition of the principles which should underlie the rules for descriptive and subject documentation" (after Lubetzky 1969: 1v).

No code for museum information systems has been found. A statement of principles for cataloguing in libraries was found. These are called the "Paris Principles" and were formulated in 1961 (International Federation of Library Associations 1971: 1-10). And a statement of the field covered by Information Science issued by the Institute for Information Scientists (in the United Kingdom) was also found. (Vickery 1987: 361-366). But no statement of principles for an information system as such, or a documentation system was found.

Nor could any statement of principles for subject documentation or classification and indexing as practised in library and information science be found. This is a field which is undergoing very rapid change at the moment so it is not surprising that this problem has not yet been solved. There are statements of method, such as Sears Subject Headings or the Subject Cataloguing Manual: Subject Headings, but none of general underlying principles.

From the literature available in library and information science and museology the author has had the temerity to attempt to extract very general principles which, it is hoped, will provide a basis for further action.

6.1.1 A CODE OF PRACTICE

The first professional group to formulate such principles and a code was the library profession. Sets of rules for describing how the books of a library should be catalogued were developed in the 19th century. The first rules were prepared by individuals for individual institutions. Panizzi's British Museum Rules for the Compiling of the Catalogue in 1841, was the first major modern statement of principles underlying catalogue rules. It specified the kinds of entries to be adopted and gave directions on the choice and rendering of headings for certain classes of work and authorship. The soundness of this code with its principle of author main entry plus added entries and references based on the content and needs of individual books together with its practical rulings as to choice of headings has caused it to be used as the basis of every major author catalogue code since (Chan 1981: 11; Landau 1966: 90-91; Wynar 1980: 37).

Librarians gradually realised the advantages of co-operation between libraries, and the standardisation of practice. The need for the codification of cataloguing practice became apparent. Compatibility of catalogue records in different libraries was a perceived service to users, enabling them to make better use of the library (Chan 1981: 11). Then in 1901 the Library of Congress began its printed card service, with the result that libraries became interested in ways to use L.C. cards with their own cards (Wynar 1980: 37).

During the 20th century all further cataloguing codes compiled were the work of committees. The first was a Committee of the American Library Association and the (British) Library Association which sat for 7 years (1901-1908) examining ways in which cataloguing rules could be formulated in order to encourage the incorporation of L.C. printed cards into the catalogues of other libraries. The committee attempted to reconcile the cataloguing practices of L.C. with those of other research and scholarly libraries (Wynar 1980: 37). The resulting code reflected all previous codes and set the tone for the next thirty years (Chan 1981: 13). Revisions

of this code were produced in 1949, 1967, 1978. They culminated in 1961 in the formulation of a set of principles for cataloguing, agreed to at an international conference in Paris (Landau 1966: 92; Wynar 1980: 37-42). They are known as the "Paris Principles" and are in turn the basis of the International Standard Bibliographic Description (International Federation of Library Associations 1974, 1977).

During the twentieth century the co-operation between libraries increased as they found that centralised or co-operative cataloguing had pronounced economic benefits for the organisations involved, and this in turn reinforced the movement towards standardized cataloguing practice (Chan 1981: 11).

Problems arose from a number of circumstances, the chief among them being :

- the increased output of publications reporting research results
- the spread of research work to more countries using different languages and the need of specialists for up-to-date information

- the growth of national agencies which produce and distribute catalogue cards, suggesting possibilities for economics in cataloguing costs.
- the use of these cards for the compilation of international bibliographies and of union catalogues in special fields.
- the emergence of bibliographical activity in newly independent countries has created a real need for principles and standards in cataloguing (International Federation of Library Associations 1971: 14-15).

These problems created an urgent need in the international library world for increased acceptability and interchangeability of entries in catalogues and bibliographies in different countries. There was also a need to ensure speed and certainty in searches for information in catalogues produced in different countries (International Federation of Library Associations 1971: 19). A conference for this purpose called the International Conference on Cataloguing Principles was held in

Paris in October, 1961. It was attended by representatives from 53 countries (International Federation of Library Associations 1971: 1-10).

The impetus for the formulation of these principles came from the library profession's desire to render a service and make information available. There is a long history of international co-operation behind the desire to achieve this goal. Agreement on a set of principles was seen as an invaluable guide for the revision of existing cataloguing codes and as a guide in the development of library and bibliographical activity in countries where such services are being built up (International Federation of Library Associations 1971: 19). The conference formulated the "Paris Principles" which are the basis of the Second Edition of the Anglo-American cataloguing rules and also of some of the principles proposed in this study.

6.1.2 THE REQUISITES FOR A CODE

In order for the development of principles to be successful certain common fundamental orientations are necessary among all participants. They constitute agreement on :

- the type of organisation to be served
 - the concept of different levels of recording
 - the type of collection
 - the type of information system to be constructed
- (Anglo American cataloguing rules 1967: 1).

These factors affect the application of the principles to rules (International Federation of Library Associations 1971: 5).

At the start of the Paris Conference the recommendation was made by Mr. E.N.Petersen, Head of the Division Libraries, Documentation, and Archives of UNESCO, that the conference should "not aim at complete uniformity but rather seek to establish sound general principles on which agreement can be reached and which will form the basis of cataloguing work in each country" (International Federation of Library Associations 1971: 14). This advice is equally valid for any set of principles proposed for the museum world.

Every possible attempt should be made to frame the principles for a very wide application recognising the value of the widest possible uniformity in the construction and arrangement of the information systems in widely differing contexts (International Federation of Library Associations 1971: 5). All participants can then use the principles to frame rules for use in their own institutions. They are naturally free to accept or reject the recommendations contained in the principles. Most of the differences between libraries have appeared in the detail rather than in the general principles underlying the rules.

It is suggested that this is a course of action which museums could well consider following.

6.1.2.1 Type of organisation

It is suggested that the principles in the code be framed as generally as possible so that it is possible for them to be used by large, medium or small size institutions. However it is suggested that it be compiled chiefly for use in medium sized, general institutions. Then it is easy to scale the application of the principles up or down to suit the institution concerned (Anglo American cataloguing

rules 1967: 1). Should the needs of different types of institutions prove irreconcilable, then the principles should be reviewed or alternatives provided (Anglo American cataloguing rules 1967: 1).

In the museum world there is a tendency to recognise only "résearch" museums. There is no consideration that museums at different levels might serve "different" sections of the public or have differing information needs. This is a question which has not yet been discussed in museum circles, even though there is a definite need to do so.

A basic law of information science is that systems must be constructed to serve the needs of the users. Museums must also decide who their information system users will be.

6.1.2.2. Concept of levels of recording

Another concept in the formulation of a code is that of different levels of information recording. Provision must be made in this respect. In the library world it is a familiar concept, which caters for the differing needs of different institutions and is embodied in the Anglo American cataloguing rules (1978). The Rules provide three levels of

description with increasing amounts of detail at each level. The documentalist or cataloguer can then choose the level that provides the amount of detail relevant to that particular institution's needs and at the same time meet the standards called for in any set of international documentation principles and rules (Wynar 1980: 41).

This approach is already evident in the first hesitant steps towards documentation codes taken by the museum world. It appears in the draft Museum Documentation Standards of the SAMA Documentation Group in the concept of essential information categories and recommended information categories. (Southern African Museums Association. Documentation Group 1987). The same idea is also evident in the Transvaal Provincial Museum Service's Documentation Manuals (Transvaal Provincial Administration 1977: IVA: 11). The suggestion in these manuals and standards is that the information system be started at the simplest level and upgraded as the means become available to do so. This is particularly viable in automated information system.

6.1.2.3 Type of collections

All museums deal with collections of material albeit of different kinds. They are seen to collect mainly three dimensional items whether historical, art, ethnographic, archaeological or natural history items (Southern African Museums Association 1979: 2). The museum also contains collections in a two dimensional format (bibliographic, art and archival) (Landau 1966: 248-249) and raw data resulting from research projects. There are also records from the collection items, associated information from the people, places, dates, or events connected with the item; the "support" information such as conservation records, record photographs, biographic or bibliographic information and information from other sources such as environmental records (Roberts 1985: 29). The term "information unit " is used in this study to simplify reference to the wide variety of material which a museum may contain.

6.1.2.4 Type of information system

There are as many different possible types of information system as there are institutions because each is unique due to their particular set of

circumstances. However, they differ mainly in their size, disciplines and financial status which in turn will determine the staff and equipment available to them with which to run the information system.

The system in question may be centred in a department or be centralised for all the departments of one institution in an information centre. This would seem to be the more useful and financially better method of organising things since a common standard can be created and specific staff can be given the sole responsibility for managing it. The creation of the system then becomes the responsibility of the information centre.

In endeavouring to produce a set of principles for an information system and deciding the type of information system which should be produced, there are two questions which must be answered. The first question to ask is does one wish to have more than one record per item ? If it is decided that there should be a main record and several different access points, then a multiple record information system is to be constructed.

There is an assumption that sufficient entries will be made for each information unit documented so that access to the information unit is possible under any approaches which may reasonably be anticipated by the user (Anglo American cataloguing rules 1967: 1).

The next question relates to the type of information system which should be built. The choice lies between an alphabetical and a systematic information system. An alphabetical system has the records arranged in an alphabetical sequence according to a catchword. In the systematic system the records are arranged according to predetermined patterns or classification schemes. It would seem that a systematic rather than an alphabetical information system would be appropriate in museums because an information system arranged according to the degree of an academic discipline provides an efficient research mechanism for users familiar with that discipline.

6.2.3 USE OF THE PRINCIPLES

The principles, once framed, are used to develop a Code of Descriptive Documentation Practice by which the three-dimensional information units can be

documented. Two dimensional information units should be recorded according to the rules in the Anglo American cataloguing rules (1978). Needless to say the principles underlying the two sets of rules should be compatible.

Rules for Descriptive Documentation are necessary and important because :

- they help to expedite the work of recording by providing the documentalist with ready directions to follow.
- they help to insure uniformity and consistency in the treatment of material without which the information system tends to become increasingly chaotic and confusing.
- they facilitate the exchange of machine readable information
(Lubetzky 1969: 1).

A comprehension of the purposes, problems and principles of the information system is a prerequisite for an understanding of the rules which are derived from them, their effective application and further improvement. This is especially

important at a time when regional, national and international co-operative projects are dreamt of, and the utilisation of the computer in the preparation and explanation of the museum collections is within view. (Lubetzky 1969: IV).

The decisions taken on all aspects of descriptive documentation must be recorded. They then serve as rules which can be systematised into a coherent framework called the code (Burger 1985 ms ; Webster 1974: 216). This saves time and effort in executing the various descriptive documentation tasks and provides continuity through staff changes. An information system constructed according to the rules will probably serve its users better than a file of inconsistent records.

6.2 CONCLUSION

Until recently every museum established its own documentation rules by which it tried to ensure consistency. These were usually very brief and elementary. The developments in computerised documentation have resulted in greater interest and more in-depth attention being paid to the information system and documentation methods in museums.

In order to facilitate the exchange of information between information systems within an institution, between institutions, between regions or nations it is suggested that the museum world should try to frame principles for a museum information system. They should be of a general nature which can be used to form the basis of the development of an information system in each institution (after International Federation of Library Associations 1971: 14) and participating organisations should naturally be free to accept or reject the recommendations (Anglo American cataloguing rules 1967: 1).

The principles are used to construct the rules used in descriptive documentation; the latter process entails the process of creating the surrogate record which is the basic component of the information system on which all its activities depend. A record constructed according to the principles in the code will ensure that these activities are a success.

CHAPTER 7

THE PRINCIPLES OF AN INFORMATION SYSTEM

7.1 INTRODUCTION

The problems encountered in museum documentation have been examined and an attempt made to place it within a framework of information systems theory. This has had the advantage of showing how little has actually been done and how much remains to be accomplished.

The investigation has centred on the practicality of creating a central information resource in the museum which can handle information on a multi-media and multi-disciplinary basis, regardless of the physical form of its source (object, natural history specimen, book, or manuscript) of the discipline to which it is affiliated. In order to do this there must be a basically similar structure underlying all the records in the system which will allow for the comparison of information and its extraction as required.

It is suggested that possible solutions to some of the problems posed by these requirements lie in the principles of cataloguing and classification practice found in library and information science. As already discussed, information and its retrieval are governed by the twin considerations of the nature of information and the nature of the user. This is a complex and fascinating study. In an effort to construct a framework within which these two variables can be related in different ways according to the circumstances of each unique situation, this author proposes a series of principles which can be embodied in a code.

The following principles are provided as a base and framework for achieving the functions of museum documentation, and promoting standardisation. They are discussed in the three chapters: Principles of information systems, Principles of descriptive documentation and Principles of subject documentation.

7.2 STATEMENT OF SCOPE

A statement of scope for all three sets of principles is that: " The principles stated here apply to the construction of an interdisciplinary, multi - media information system in a large general museum. The information should be recorded under the item name or other appropriate identification element according to the discipline concerned. The record may be combined into one or a variety of different sequences in the information system. They are framed to be applicable to the wide range of material found in museum collections and to meet the information needs of a large general museum arising from its activities of collection, preservation, research and interpretation. The principles are also recommended for application to the information systems of other institutions with such modifications as may be required by the purposes of these information systems.

This statement sets out the limits envisaged for the application of the following principles (Anglo-American cataloguing rules 1978: 1-4; International Federation of Library Associations 1971: 24). It allows a very broad application of the

principles recognising the value of the widest possible uniformity in the arrangement of all types of information systems of museum material (International Federation of Library Associations 1971: 5).

This statement of scope raises a number of interesting considerations if analysed in detail. The following is an analysis and comment on different phrases in the statement.

7.2.1 "Construction of an interdisciplinary, multi-media information system This is stated to emphasize the wide range of material and divergent information needs which it will be necessary to accommodate. A museum collection houses a number of different types of collections. Hence the information system must be able to accommodate a wide variety of different types of records stemming from collections of objects, books, manuscripts, photographs and natural history items: from their associated information; support information, discipline data and information from other documentary sources (Roberts 1985: 29).

7.2.2 "in large general museums" In South Africa only one large museum is in the process of creating a central information system for all its collections (M.Holscher 1989:pers.comm.). All other large institutions have departmental collection systems. No need is felt for a joint **information** system. Interestingly enough the effect of the computerisation of museum information systems has been to stimulate a "joint catalogue" approach in the larger institutions in England and America. This trend may become evident in South Africa in the future as more museums computerise their collection records.

7.2.3 "records should be under the item name or other appropriate identification element according to the discipline concerned" Two dimensional materials are generally recorded under the name of the person responsible for their creation, artist, or author, but three dimensional items, particularly in the natural sciences do not have an "author" in the accepted sense of the word. This raises the problem as to which aspect should be used as a unique identifier for the item. It is customary to apply differentiating names to items so that they may be uniquely identified e.g. differentiate between a cook's spoon and a dessert spoon or

between a crested barbet and a crested bulbul. This is discussed in greater detail in Chapter 8: Descriptive Documentation, Principle 5. The part of the phrase which reads "another appropriate identification element " arises from the practice in some collections of identifying the item first by its physical form e.g. photograph or manuscript and then by details such as subject, or author which are unique identifiers for that particular type of item. The aspect of an item which will be chosen as a unique identifier depends very much on the collection and discipline concerned.

7.2.4 "may be combined into one or a variety of different sequences in the information system ". The sequences which may be used can be either alphabetic or systematic. In the "Paris Principles" for libraries an alphabetic sequence is recommended as the most appropriate form. However the single alphabetic sequence is not necessarily the most effective form of system to use in a museum.

Libraries started with classified catalogues in the eighteenth century and have since changed either to a dictionary catalogue using a strict alphabetical sequence for author, title, added entry and subject entries or a divided sequence with separate

alphabetic and subject entry catalogues. Currently the divided catalogue is the most popular form (Wynar 1980: 14-15). But for museums with their specialised collections and the fact that most are a reflection of an academic discipline, both the information system and the collection are organised to reflect the organisation of knowledge within that discipline. This means that a systematic information system is the preferred form. It also facilitates greater in-depth searching in the information system which is a requirement in catalogues of specialised libraries, and so will also probably be for museums.

In the ensuing discussion the term "information system" is used to refer to a list of information units arranged in a **definite** order (but not necessarily alphabetical) which records, describes and indexes (usually completely) the resources of a collection, museum or group of museums. (after Harrod 1971: 127).

7.2.5 "framed to be applicable to the wide range of material found in museum collections and the information needs arising from its activities." This sentence is included to emphasize that the information system has the two-fold purpose of

meeting the information needs of the institution and recording the collections and the activities for which they are used. The information system must :

- record collections
- make collections and information available
- record the activities for which both collections and activities are used (Light 1988: 48).

7.2.6 "principles recommended for application to other institutions " The principles have been formulated particularly for the museum information system but it is hoped they will also be broadly applicable to the information systems in other information institutions such as the library or the archive.

7.2.7 CONCLUSION

A scope statement of this nature is essential for any general statement of principles as it defines the parameters within which they are considered to be effective.

7.3 PRINCIPLE 1 :PURPOSE OF MUSEUM INFORMATION SYSTEMS

Suggested principle: The purpose of museum information systems is to make recorded knowledge available to potential users.

Discussion: This statement of purpose begs several questions :

- what is information ?
- what is an information system ?
- what is the purpose of an information system ?
- what is recorded knowledge ?
- what form do the records take ?
- who are the potential users ?
- how is information made readily available ?

All these types are briefly discussed in the following section with specific reference to the museum.

7.3.1 What is information ?

As explained earlier information is essentially a "thing " or a product that is communicated between people. (Ashworth 1979: 37). It may be fact, fiction or merely an interpretation of the same (Buchanan 1979: 9). It can be enhanced by the processing, collection and correlation of isolated data, by analysis from a certain point of view or rewritten for a better understanding (Ashworth 1979: 37).

7.3.2. What is an information system ?

An information system is the set of connected parts which is used to organise an unorganised mass of information so as to provide convenient access to any part of it which is sought in response to a request (Kent 1966: 19-20). The parts are the people, equipment, and procedures ordered for the convenient accomplishment of the objective of providing information (Kirk 1973: 1).

7.3.3 What is the purpose of an information system ?

The purpose of an information system is to organise an unorganised (or insufficiently organised) mass of information so as to provide convenient access to any part of it which is sought in response to a request (Kent 1966: 19-20).

7.3.4 What is recorded knowledge ?

As already discussed the information system will house information relating to a wide variety of things and activities. Obviously the item or activity cannot itself be put into the system. A means must be found to "represent" them in the information system. This is done by creating a record which contains all the information relating to the information item. It is a surrogate for the item it describes. Recorded knowledge may also be books, manuscripts periodicals and so on, but in the sense used in this study it is the written record of an information unit which is used in the information system.

If the record is to serve as a surrogate for the information unit then the significant aspects of the unit must be recognised, as these are the access points by which it will be sought. These aspects can be used in the information system to facilitate its use and effectiveness (Lubetzky 1969: 11).

The surrogate can then be arranged in different ways in the information system to give access to the information it contains. This information will stem from the unit itself, either its physical form (e.g. book, table or bird) or the associated information, support information or research data. In order for the information to be useful it has to be recorded systematically and this implies an analysis of the types of information which occur so that the surrogate is consistently useful (Hoffman 1976: 41-45).

7.3.5 What form does the record take ?

The record can be held in a variety of physical or electronic recording media, such as paper, card, film, magnetic tape or disks. They are the physical medium used to carry the data in any

information system. They are called data vehicles, recording or searchable media (Kent 1966: 31; Orna and Pettit 1980: 77).

For manual systems the choice usually lies in a type of card, namely item or feature cards in a plain, preprinted, edge-notched or punched format and microforms (Kent 1966: 43-52; Orna and Pettit 1980: 77-82). For automated systems the choice lies between tapes and disks,. The tapes can be magnetic or punched paper tapes and the disks are also magnetic (Kent 1966: 53-60).

7.3.6 Who are the potential users ?

The potential users of the information system will be identified as mainly the staff, and very occasionally, members of the public. This is discussed in greater detail under Principle 3 in this chapter.

7.3.7 How is information made readily available ?

Information is made readily available by being systematically organised, which is a necessary prerequisite for all services (Hoffman 1976: 1). The

record, a surrogate for the information unit, is used to achieve systematic organisation resulting in the information system (Hoffman 1976: 1,5,6,).

In order to systematically organise the information, certain activities must be performed. They are :

- firstly the type of information which is going to be put into the system must be identified
- secondly the information must be analysed so that one knows the type of material being dealt with
- thirdly the information must be organised and synthesized so that it can be retrieved (Brown 1976: frame 172).

These activities constitute the different stages or steps in the construction of an information system.

7.3.7.1 The construction of an information system

The first stage in the construction of an information system is the selection and acquisition of information units which is obviously important,

as without the information units there would be no system. The question is who acquires the units which are recorded in the information system. In an Information Centre in a library or industrial context it is usually the Centre staff who are responsible for the location, selection, ordering and receiving of source material (Kent 1965: 23 ; Turner 1987: 4). But in the museum the situation is different. Curatorial and research staff deal with highly specialised material which often has to be collected during fieldwork. This means that they, and not the Information Centre staff are usually responsible for augmenting the collection. Even archival and documentary material will probably be acquired by the curatorial staff rather than the Centre staff. Therefore the selection and acquisition of material to be input into the system which are normally part of the responsibilities of staff connected to the information system, are not part of it in the museum context.

This arises from the museum situation which differs from that of other information institutions. The second stage in the construction of an information system is the description and indexing of the information units and their records. It is a process of identifying what an information unit is about,

and then describing it in a way which will match the search requirements of the user (Turner 1987: 4). The different techniques of analysis and synthesis used in library and information science can be employed to achieve this.

This stage is accomplished in a number of separate steps. They are :

- analysis of the information unit's information
- the recording of the information in a structured way on a physical recording medium, and decisions on suitable access points from the records. This is known as descriptive documentation.
- the synthesis of these access points into an organised system so that they can be retrieved. This is called subject documentation.

The analysis of the information unit is the process of identifying what the information unit is about (Turner 1987: 4; Vickery 1970: 37). It is defined as the process of breaking something up into its simplest elements (Concise Oxford 1964: 42). In the case of the museum information unit all the

different types of information which might be found with a unit are analysed into separate categories so that they can easily be compared to other similar records. Standardisation is necessary for comparison (Hoffman 1976: 41). Once the nature of the record has been determined it provides the framework into which the information for each individual unit is fitted. (Wynar 1980: 1).

The analysed information is then recorded in the prescribed way to create the formal description of the information unit which is called a "record". It is the record which is used in the information system as a surrogate for the information unit. The preparation of the record is known as descriptive documentation.

It is defined as being concerned with the identification and description of an information unit, the recording of the information in the form of a record and the selection and formatting of access points other than subject access points (Chan 1981: 11; Wynar 1980: 7). The decisions which have to be made during this process are explored in greater detail in Chapter 8 : Descriptive

Documentation and include questions such as the recording structure which should be used and the recording conventions which should be formulated.

Analysis also reveals different features on the record which can be used as access points to index the system by. (Brown 1976: frame 40). They may be proper names of people, places or events, dates, or subject concepts. The kinds of concepts and types of terms which are used in a system are policy decisions to be made by each institution according to its circumstances. (Vickery 1970: 37).

The organisation of the access points is known as "Subject Documentation". It is defined as "the provision of a logical and meaningful system for the identification of information required by the user and to transform concepts, impressions or data into recognisable objects and recurring patterns which simplify the process of thought and are retrievable" (Buchanan 1979: 10; Classification 1971: 1; Langridge 1973: 15). This will facilitate the retrieval of information from the system in answer to a user's queries. (Brown 1976: frame 40; Vickery 1970: 37). The third stage of the construction of an information system is the recording of the description on a suitable recording medium such as a

card, tape, film or disk and its storage. In the museum, cards have been the favoured recording medium to date, but this is rapidly changing as the impact of personal computers and the easy manipulation of data they provide is covered by the museum profession.

The manner in which the records are stored is called the access organisation of the information system. Two methods can be used, either alphabetical or systematic. (Kent 1965: 23; Vickery 1970: 37). The access organisation chosen should be the most suitable one for the users concerned. The pro's and con's of the two methods of access organisation are more thoroughly explored in Subject Documentation : Principle 2 .

Once the construction of the information system is complete the use of the system comes under consideration. This is known as the search or output phase of an information system. These are the answers received to queries posed by the users. The retrieval of information can be broken down into several distinct steps.

They are :

- receiving the user's queries
 - devising a search strategy
 - delivery of the results of the search
- (Kent 1966: 20; Vickery 1970: 37).

The results achieved from the search will obviously vary according to the query received and constraints such as time, and money. Some systems that involve the user interactively with the information store itself, result in the user actually finding answers to problems while the search is in progress. However other systems have the user searching only in indexes which point him to possible sources of information for his query such as an author, title or the accession number of items.(Turner 1987: 6). The strategies devised to deal with users' queries will be further refined as the nature of the queries becomes known and the available sources of information become better known and exploited. At the moment these are all unknown features in a museum information system.

7.3.8 CONCLUSION

The museum information system should be seen primarily as an instrument for the use of the staff in the execution of the museum's functions, namely collection management, research, display and education. It is an instrument for the use of a small, diversely and highly educated group which will inevitably affect the system. High levels of performance are required of the system, by the users regarding depth of enquiry, speed of delivery and quality of the end results. All information systems must be tailored to meet the needs of the user. The discussions in this section are all hypothetical as these aspects await detailed studies for their potential use in museums.

7.4 Principle 2 : THE FUNCTIONS OF A MUSEUM INFORMATION SYSTEM

Suggested principle: The function of a museum information system is to be an efficient instrument for assisting in the management of the collections. This is done by :

(1) Providing managerial assistance to :

- aid in the care and control of collections
- aid in the use of the collections
- aid in the preservation of information

(2) Enabling the user to ascertain :

- the museum's holdings of items sought under their specific name, group name or subject
- enable the user to find any item under any of these aspects

- assist the user in the choice of items for display, education or research purposes if it is sought according to its physical nature or associated information.

Discussion

This principle deals with the basic purpose of the information system, namely to aid in the care, control and use of the collections and preservation of information. It should provide the user with the help necessary to enable optimum use of the collections to be made in any of the above spheres. (Lubetzky 1969: 10; Roberts 1985: 25).

As the functioning and methods of library and museum information systems are continually being contrasted in this study it is interesting to note the differences in the emphasis of the statement of purpose between the two institutions. The emphasis for bibliographic material is to show what is in an institution and draw attention to related material (Lubetzky 1969: 10). While in the museum these functions are recognised as well as those concerned with care, control and preservation functions (Light 1988: 48; Roberts 1985: 25).

The purpose of the museum information system can be defined as a system which records, describes and indexes the resources of a collection, institution or group of institutions in order to assist in the control and use of the collections and to ensure the preservation of information about the use of the system and the cultural and environmental heritage of the community. (Anglo American cataloguing rules 1978: 564; Harrod 1971: 127; Landau 1971: 90; Light 1988: 48; Roberts 1985: 25).

7.4.1 Functions of the museum information system

Traditionally there are two opposing views as to the purpose of a bibliographic information system. One opinion group sees it as a finding list to the information units in the collection and the other group as a source of information about information units revealing relationships between them (Light 1988: 48; Lubetzky 1969: 6; Roberts 1985: 25). Both of these approaches to the information system are also present in the museum world.

The finding list approach to the information system can be achieved with an abbreviated record and the provision of multiple access points which indicate the presence of the information unit in the

collection and its location. This is the first and historically older function of the information system (Burger, 1985: n.p.). The finding list approach provides the user with access to individual items regardless of the approach used. The information system constructed on this principle is efficient in showing whether or not a particular work or item is in the collection and its location (Wynar 1980: 6). But it does not show relationships between information units or preserve information (Light 1988: 48; Wynar 1980: 6).

The second type of information system is the one constructed to be both a finding list and a source of information which will enable it to be used for a broader range of activities. The records should be fairly full descriptions of the items, which enable the user to differentiate between items; they should, also be so organised that related items are collocated (Burger 1985: n.p.).

The collocating function provides a means for bringing together in one place in an information system all records for like and closely related material (Wynar 1980: 16). To achieve collocation the main record for an information unit must be in a standardized format (Wynar 1980: 17). In the museum

world one finds that the finding list approach is prevalent among small institutions where there is no specialised staff and a lack of staff to do documentation anyway. The fuller records of the "information" approach are usually found in larger institutions with subject specialists and sometimes documentalists as well. This is far more time and energy consuming than the former approach.

Economics and size play a role here. The finding list information system records a shallower level of information which means it can be compiled by a lower level of staff and consumes less staff time. The information system which seeks to serve as a finding list and collocating agent needs detailed information content, extensive access points and is often complex to run. This is intensive, both in terms of the level of staff needed to compile and run it and of staff time. The decision on which type of information system is constructed will unfortunately be substantially affected by the economics of the institution.

The choice of system which is implemented in a museum will naturally have a substantial effect upon the services offered. A "finding list" approach will only enable the user to find a unit in the

collection. It will not be possible to link related units through their museological or associated information. This can be done only if this information is input in a structured form into the system.

7.4.2 Economic aspects of the information system

The information system which functions at the centre of all an institutions activities is the least understood and most criticised aspect of the museum. During times of economic stress documentation becomes a ready target of economy drives (Lubetzky 1969: 7). But economics in the documentation system will increase costs in other operations and affect services offered by the institution (Lubetzky 1969: 3).

The specific functions of the information system are divided into management and identification. In this the museum information system differs markedly from the library which officially recognises only the identification functions of the catalogue in the Paris Principles (Roberts 1985: 25; Wynar 1980: 15). It can be seen that the museum requires the

information system to meet far wider and more complex functions than the other information institutions.

The managerial functions of the information system are listed as care and control of collections, their use in all extension activities and the preservation of information (Light 1988: 48; Roberts 1985: 25). These have already been discussed under "Functions " in Chapter 2 .

7.4.3 The identification of information units

The second group of functions are those concerned with the identification of information units through the information system. The information units may be sought either through their physical nature or their subject associations. The first function of the information system outlined in Principle 2 is to assist the user in tracing the presence of a particular unit in the institution (International Federation of Library Associations 1971: 6). It further specifies the identification elements which should reasonably be used as access points. The access points noted in this section are those

thought by the author to be most relevant, as there has to date been no discussion of this point by the museum profession.

These identification elements are found described on the information unit record. The record should be formulated in accordance with specified rules providing sufficient detail for the information system user to identify and describe the unit (International Federation of Library Associations 1971: 6). The crucial factor to be borne in mind is that the record must contain sufficient information to allow a unit to be positively identified and differentiated from others of the same kind (Harrod 1971: 127). These same identification elements are used in the information system to trace units sought (International Federation of Library Associations 1971: 6).

Principle 2.2.2 states that the user must be able to find any information unit under any of the aspects mentioned. This is a reflection of the information system user's need to be able to access the information in the information system from several different access points. While this seems a

self-evident truth to any regular library catalogue uses, it is not necessarily so to the museum information system.

Principle 2.2. emphasizes the need for a good information system in the execution of all a museum's functions. Often these functions are performed without recourse to an information system, reliance being placed on staff memory of the collections. This is not a satisfactory state of affairs and should be discouraged whenever possible. It was made possible in the past by the permanency of staff: there was very little movement of staff which meant they knew the collections well. There is currently a growing tendency for greater mobility of staff between institutions which means the staff do not know the collections as intimately as they did in the past.

7.4.3 CONCLUSION

The functions of a museum information system have been spelt out in the management context and for the identification of information units. These are two complementary and frequently overlapping functions. The one does not occur without the other, but it has

been considered worthwhile to state them separately in order to emphasize their similar yet differing roles.

7.5 PRINCIPLE 3: THE COMPONENTS OF AN INFORMATION SYSTEM

Suggested principle: The components of an information system are:

- the information units
- the records of the information units
- the subject concepts of the information units
- the user and his needs

Discussion

The components of an information system are the information units and their records, the subject concepts derived from them and the user of the system: there would be no system if there were not information units and users who require them.

7.5.1 The information unit

The first component of an information system is the information units which contain information which will be sought by the user. An information system is concerned with the ability to find information when it is required. In libraries or usual information centres the information which is sought is usually recorded knowledge contained in a suitable format such as a book or manuscript (Kent 1966: 3). In a museum one seeks to retrieve information which is communicated in a variety of ways, either recorded in written or visual form.

The entities represented by records in a museum information system can be one of a wide variety of "things". It may be the items from the collections which range widely over natural, cultural, industrial or archaeological material (Southern African Museums Association. Documentation Group. 1987: 2). Or it may be recorded information in bibliographic, archival or documentary form; or raw research data resulting from projects.

To simplify communication in this study the term "information unit" is used to refer to any discrete unit for which a separate record is entered into the information system. The term is employed because of the wide variety of items it is proposed for incorporation into the system. The information units on which the system is based are a crucial factor in the system because the nature of the units (along with the users) will determine all other aspects of the information system being considered.

7.5.2 The record of the information unit

The record of the information system is a description of the information unit and all associated information preserved in written form (Concise Oxford 1964: 1034).

Information systems are concerned with organising information so that it can be found when needed. The simplest method of doing so is to arrange the information themselves in the order in which they are most likely to be sought (Orna and Pettit 1980: 9; Turner 1987: 12). For example books are sought by their author or title and museum items by the name

of the item. The retrieval of material then depends on the users knowledge of the collection and its organisation (Orna and Pettit 1980: 9).

Problems arise when there is more than one possible access point. The best way to achieve success is to be able to place the item or a representative of it in more than one place (Orna and Pettit 1980: 9). The representative of the information unit is the record which describes its characteristics and thus acts as a surrogate for the actual unit (Hoffman 1976: 41-45; Orna and Pettit 1980: 9).

The records are carefully structured in a standardised format so that they can be manipulated in order to increase the access to the system (Turner 1987: 12). It is easier to manipulate a record with a standardised format for comparative purposes (Chan 1981: 21). The series of records can be arranged in different sequences to give access to the records under different "points of view" (Turner 1987: 5).

The sources from which the information is drawn to make up the record differ from unit to information unit. This is important as it affects the accuracy and acceptability of the data. As regards

bibliographic and documentary materials agreement has been reached within the respective professions, the matter being embodied in cataloguing codes and professional handbooks. With respect to books, manuscripts, printed music and periodicals for example information on the title page is preferred; for microforms or films it is the title frame; for sound recordings it is the label and sometimes the container (Wynar 1980: 18). Usually the chief source of information provides the most complete bibliographic information.

For museum information units this problem is not so easily dealt with. For those items which are similar to library stock, the same rules can be applied but for three-dimensional items, the item itself becomes the source of information (Wynar 1980: 18). It can supply some of the information required (e.g. name, physical description) but not all; the associated and museological information which by its very nature is visible in the collection item itself, accrues to it during its "lifetime" (Southern African Museums Association Documentation Group 1987: 5).

For information units in Human Sciences collections the associated information (i.e. stories of people, places events and dates associated with the collection item) with which an item enters the collection, is very important. It should be recorded as soon as possible. The Transvaal Provincial Museum Service recommends that a "collecting form" be used for this purpose (Transvaal Provincial Administration 1977: v2: 5).

The record description derived from the information unit makes up the catalogue or equivalent information file. And so, although one step removed from the units themselves, they represent the units in all aspects of the system.

Once the information source for a particular type of information unit has been decided, the next step in the process is the description of the unit and the recording of this information. The level of information recorded and the way it is structured on the record are discussed in the section on levels of description and record information.

The process of creating the record are extremely important. In librarianship it has developed into a complex study called "cataloguing" governed by a set

of principles called the "Paris Principles" (Orna and Pettit 1980: 9). These are examined in greater depth further on.

In museum work these actions or tasks lack a clearly defined terminology. By analogy with librarianship the author wishes to make a few suggestions.

In librarianship the following terms are used in the contexts indicated. The compilation of the record is termed cataloguing and the compilation of the record, excluding the subject aspects is called descriptive cataloguing (Chan 1981: 11). It is concerned with the identification and description of the item, the recording of this information in the form of a catalogue record and the selection and formatting of access points except subject access points (Chan 1981: 11; Wynar 1980: 17). For bibliographic material this means access by authors name or title (Chan 1981: 85) and for collection item by item name.

The term descriptive cataloguing was first coined by the Survey Committee of the Library of Congress (Harrod 1971: 210). When used in the bibliographic context it refers to the physical nature of the item

and to the responsibility for the intellectual content without reference to the subject aspects (Wynar 1980: 17).

In the museum context one should possibly also consider the term "descriptive documentation" for the same process since "documentation " appears in the museological literature to be the preferred term, rather than cataloguing. The important point to note here is that the "descriptive" aspect of the cataloguing/documentation action is seen to be a separate activity from the "subject" aspect (which is briefly discussed in Principle 3.3.). The principles of descriptive cataloguing/ documentation are discussed in greater detail in Chapter 8: Descriptive Documentation.

From the foregoing it can be seen that the construction of a record involves the consideration of a number of theoretical issues, such as the reason for the record, what information should be recorded, where it should be obtained and a suitable terminology.

7.5.3 The subject concepts of the information units

The subject aspect of an information system, especially in a museum, are exceptionally important because they enable the user to retrieve information in relation to a variety of access points on an interdisciplinary and multi-media basis (Brown 1976: 25). The subject content inherent in the information units and their associated information is recognised as the third important component of the information system.

The information system contains information units from the collections, documentary and literary material, and raw research data found in both the curatorial departments and the institution's library. The real value of such a system will only be realised if it can reveal the subject connections for any topic between these diverse sources. The development of this aspect of the information system has been called the "subject approach" by both Foskett and Turner (Foskett 1977; Turner 1987: 51). The purpose of the subject approach is firstly to enable the user to find the material he seeks, and

secondly to show the holdings of a particular system on a given subject, (Chan 1981: 128; Shera and Egan 1956: 10).

The methods used in the subject approach are firstly the recognition of the subject access points, secondly their identification and labelling, (either linguistically or in codes) and thirdly their organization. These stages have definite names which sometimes have different connotations in different disciplines. This is discussed in greater depth in the thesaurus. The terminology used here is the one decided on for the purposes of this study.

The first stage, namely the recognition of subject access points is called "subject analysis" or "subject specification" in library and information science. (Langridge 1973: 110; Shera and Egan 1956: 28). The subject analysis of a unit involves the recognition of useful subject concepts in the record (Chan 1981: 133). It may be defined as "the recognition of attributes and entities which are the subject concepts in, and derived from the record of a museum information unit (after Brown 1976: frame 38; Langridge 1973: 110; Sharp 1965: 28).

The result of the analysis is a subject access point or subject entry which may be defined as "the recognition of any finite statement at any level of specificity or generality which conveys a fact or item of knowledge which may be sought by a user now or in the future " (after Concise Oxford 1964: 432).

The subject entries are then given a definite identification and labelled (either linguistically or in codes) (Langridge 1973: 112). The labelling may be done with alphabetical subject headings (either structured or unstructured) or with a notation derived from a classification scheme (Langridge 1973: 112). The labelling characterises the subject content of the access point (Turner 1987: 51; Wynar 1980: 609). At this stage one is concerned with translating the subject analysis of an information unit into a particular indexing or retrieval language, as this specialised vocabulary of terms or codes is called (Brown 1976: frame 131; Foskett 1977: 98; Turner 1987: 51). There are different kinds of retrieval language (Brown 1976: frame 131). It may be a real language or an artificial one such as a classification scheme or a list of terms (Turner 1987: 51). And finally the

index terms are arranged according to the system being used to reveal the relationships between them (Painter 1972: 3). The system provides access for the user to the information in the system (Orna and Pettit 1980: 3).

The terms used in the previous section are all derived from library and information science. They should be examined in greater detail.

The first term to be considered on a general level is the concept of abstracting and organising information in order to allow subject access to information in an information system. It is called indexing or classification. A consideration of the numerous definitions found for both terms in the text books consulted has led to the formulation of the following definition of subject documentation as the "provision of a logical and meaningful system for the identification of information required by the user and to transform unorganised concepts, impressions or data into recognisable objects and recurring patterns which simplify the process of thought and are retrievable" (Buchanan 1979: 10; Classification 1971: 1; Langridge 1973: 15).

The term " subject cataloguing " is also used to indicate the process and method employed to provide subject access to the information unit (Chan 1981: 125 ; Wynar 1980: 609). It is generally used in opposition to the term "descriptive cataloguing" to reveal and to emphasize both the descriptive and subject aspects of the cataloguing action (Wynar 1980: 609).

If the term descriptive documentation suggested in the previous section is accepted then the term subject documentation should also be considered. It would be an alternative to the terms "indexing" or "subject indexing" or "classification" meaning exactly the same. The existing body of theory in both librarianship and information science for indexing and classification will be considered for its possible application to the museum situation in Chapter 9: Subject Documentation.

7.5.4 The users of the information system

The final component of the information system is the user. This is the person whom the information system is designed to serve: his needs, use patterns and wants will determine the type of system to be constructed in a specific institution. One needs to

examine the policy of the institution to see whom it is serving and the type of service that is envisaged (Urquhart 1981: 15). These factors will affect the decisions taken regarding the record depth to be applied (1st, 2nd or 3rd level), the type of system to be instituted (alphabetic or systematic) and the arrangement of the stores. These factors are all discussed in Chapter 8 :Descriptive Documentation and Chapter 8 : Subject Documentation.

The term "museum user" is not often used in the literature because the groups who use the information system are so distinctly different, namely the general public (visitors) and specialists (staff and outside researchers). The staff in the institution are usually specialists who can be trained to operate the information system and should use it for collection management, research, display, and education. Outsiders are sometimes given access to the information system for research, but they are likely to be assisted by the documentation staff and trained in the use of the system.

The general public who may wish to use the museum's information system can range from auditors who require information about museum procedures and

collections, to donors wishing to see the item again, to students and teachers interested in the collections or members of the public with queries (Roberts 1985: 26).

The general public almost never have direct access to the museum information system. Even the query service offered by many museums is handled by the staff with or without reference to the available documentation. There are a few experimental situations in Israel and Liverpool museums where VDU terminals in the display areas give access to selected portions of the museum's collection records. There has been a very positive response from the public to this (Foster 1988: 130). It will probably completely change the usage patterns for museum information systems.

The museum information systems in contrast to library catalogues should be seen at the moment as instruments for the use of the staff in the execution of the museum's functions, especially collection management, research, display and education. If this is accepted then the information system becomes an instrument for the use of a small, highly if diversely educated group. This will inevitably affect the system.

7.5.5 The use of the system

The manner in which the system is used will also affect the way in which it is constructed. A number of factors have to be considered here.

The different types of enquiries received by the information system will be one of the determining factors in its construction. In most museums the level of answer which will be required by the specialist user is highly detailed at an elevated level. This corresponds to the pattern of enquiry found in specialist libraries. The implication is that although a limited range of disciplines will be dealt with, they must be handled in considerable detail. (Vickery 1970: 77).

For published material this is usually beyond the scope of available bibliographies and abstracting services (unless they too are directed exclusively at the specialist audience concerned). The first abstracting service for museological literature was started as recently as 1985 by the Scottish Museums Council. The institution is usually forced to construct its own, in-depth information system for the collections under its care. This system should

preferably be linked to the one used for published sources for maximum effectiveness (Vickery 1970: 14).

The depth to which collections are documented at present is very variable, chiefly dependent on the interest of, and time available to the individual curators. But no studies have as yet been done on this topic. As can be seen the user determines both the type of information and the most appropriate way of dealing with it (Langridge 1973: 23).

The quality of the enquiries will determine the quality the information system is designed to answer. This proposition is derived from the idea that a system is constructed to meet the specific requirements of the users, hence the more they demand, the higher will be the quality (Kent 1965: 276).

The users may demand that every document of potential interest is identified or they may be satisfied with a reasonably representative sample of literature on a specific subject: they may wish to retrieve only certain categories of information relating to the collections or they may wish to retrieve every possible piece of information (Kent

1965: 276). These differences in demand originate in the wide range of enquiries which a museum information system will deal with.

The speed with which an answer is required in a museum information system can vary enormously, and is yet another determining factor in the design of a system. Sometimes an answer is required extremely fast and sometimes time can be allowed before the result of a search is desired (Kent 1965: 276). There are two facets to speed: one is the speed with which the analysis of items is accomplished and related to it is the speed with which service has to be rendered to users. These are the crucial considerations in organizing an information system and service (Foskett 1977: 21).

The speed with which an answer is required affects the type of system that is used (whether automated or manual); the depth to which indexing is practised; and the stage (input or output) at which search aspects are co-ordinated. A simple query requiring an uncomplicated, unidimensional search of the system can quickly, satisfactorily and economically be done using a card based information

system. But if multi-dimensional searches are required at speed then an automated system is required (Kent 1966: 128).

The depth to which material in the system is indexed will often be determined by the speed with which it is required to be input. If a new item has to be available immediately, then time cannot be spent indexing it in detail. But if time is not crucial at this stage then depth-indexing is viable (Kent 1965: 75).

At the moment the most time-consuming aspect of the information system is the subject specification or indexing phase at the input stage. Studies show that a proportion of these entries will never be used. Efforts are being made to shift the time intensive aspect of the system to the output stage by developing mechanical methods of subject analysis or even whole text processing (Foskett 1977: 21).

As can be seen the demands made on the system regarding speed of service will be crucial considerations in the decision made regarding the type of system and the depth to which indexing is done. In the museum where speed is not usually an economic consideration, one can opt for the more

economic but slower system which will deliver results of the highest quality. Quality not speed is the main consideration in museums.

7.5.6 CONCLUSION

The components of the museum information system are the information units themselves, the records they give rise to, the subject access points derived from them and the user for whom the system is instituted. The most important aspects are the information units and the users, will determine how the record is structured and the subject access points which are indexed. It is a complete circle with each component influencing its neighbour and in part determining decisions made for problems experienced by the neighbours.

The museum information system should be seen primarily as an instrument for the use of the staff in the execution of the museums functions, namely collection management, research, display and education. It is an instrument for the use of a small, diversely and highly educated group which will inevitably affect the system. High levels of performance are required of the system, by the users regarding depth of enquiry, speed of delivery and

quality of the end results. All information systems must be tailored to meet the needs of the user. The discussions in this principle are all hypothetical as these aspects of a museum information system await detailed studies for their potential use in museums.

7.6 PRINCIPLE 4 : THE STRUCTURE OF THE INFORMATION SYSTEM

Suggested principle: The structure of the information system consists of :

- the organisation of information unit records
- the organisation of subject concepts

Discussion

The structure of an information system is determined by the demands which are made on it. The information system functions by matching the information needs of users with units which resolve those needs (Turner 1987: 3).

The system consists of the physical entities (i.e. information units) and the actions performed on them for stated purposes. The information units are represented in the system by a record which is a structured description of the unit and all its associated information. It acts as a surrogate for the information unit and allows it to be manipulated in relation to other records (Hoffman 1976: 41-45;

Orna and Pettit 1980: 7). This is a necessary prerequisite if the museum is to meet its service obligations (as was postulated earlier) (Hoffman 1976: 1; Orna and Pettit 1980: 6). An information system is the chief tool in the accomplishment of this service (Hoffman 1976: 5).

The information system consists of the two components, the physical entities and actions performed on them. The actions have been summarised as the selection and acquisition of material, its description and indexing and finally the manipulation of the system to meet users needs. (Turner 1987: 4-7).

7.6.1 The organisation of information unit records

The information units in the information system are represented by a series of records. The information in the record must be analysed into different categories so that it may be formatted in a standard manner (Hoffman 1976: 41-45). The information must be structured so that it may be encoded for retrieval at a later stage of the system procedure. The systematic organisation of information implies an analysis of the types of information which occur on the surrogate (Hoffman 1976: 41-45) In the

library and archival worlds this analysis was completed and agreed to some time ago (Chan 1981: 27-28; M.Olivier 1988: pers. comm.). But the museum world has only recently realised that a record acts as a surrogate for the unit in some circumstances and that the surrogate would benefit from construction in a similar manner at all times. Attempts to analyse the information on the museum record have been made by several bodies (Museum Documentation Association 1980a ; Southern African Museums Association. Documentation Group 1987; M.Case 1987: pers comm.) It is now being considered on an international level by the ICOM Committee on Documentation (International Council of Museums. International Committee on Documentation. Standards Working Group. Committee Meeting 1987). For the museum world, then, there is neither agreement on the information categories which must be recorded nor on the order in which that recording process should be carried out .

The information which is recorded for an information unit will naturally depend on the nature of the unit concerned, as each type will demand certain information categories. See Table 2 at the end of this study which outlines some of the information categories recognised. It will be noted there are

relatively few data categories which correspond exactly between those listed for the different types of material. Several are similar but not identical. Research data again will probably be grouped according to the discipline and its specific context. The above table demonstrates clearly the immense variety of data categories exhibited by records in a museum information system .

As can be appreciated, the organisation of the information on the record is essential if the record is to fulfill its role in the information system. This is discussed in Chapter 8: Descriptive Documentation.

7.6.2 The organization of the subject concepts

In organising the subject concepts in an information system one is faced with a series of alternate choices. The first is whether to use a structured or an unstructured retrieval language; the second is whether to use a verbal or coded retrieval language and the third choice depends on the type of system chosen in the first two options. If a verbal retrieval language was chosen then a further choice must be made between pre-co-ordinate or post-co-ordinate retrieval systems; if a coded retrieval

language was chosen then a choice must be made between an enumerative or synthetic language. These choices are explored further in Chapter 9: Subject Documentation.

7.6.3 Conclusion

The structure of the information system is determined by how the records are organised in order to gain access to the information. This is done by formatting the record in a certain manner and by the techniques adopted to create, and gain access to subject access points. These are both topics which are treated in greater detail elsewhere in this study. Suffice it say at this stage that a museum information system should be organised to make the best possible use of the available material for the purpose in hand.

7.7 PRINCIPLE 5 : THE ORGANISATION OF THE INFORMATION SYSTEM:

Suggested principle : The information system is intended to be able to deliver information of a suitable kind and level to the user as requested. This is achieved through the organisation of the records. It may be:

- an alphabetic organisation
- a systematic organisation

Discussion :

The museum information system consists of the information units and their surrogate records and the actions or demands (requests for information) which are made on it. This involves matching the information needs of users with the information units which will resolve those needs (Turner 1987: 3).

Any information system is intended to deliver the information required, when it is required, in a useful form. This is the bottom line of the service it is intended to deliver. This is achieved by the

records in the information system which enable the user to identify which particular information units in the system he wishes to review or use, as well as by the subject index which enables the user to see the subject coverage of the system within his particular field of interest.

The components of this service should be examined briefly, namely the physical entities (the information units and their records) and the requests for information (actions performed on them for stated purposes).

The information units are represented in the system by a record which is a structured description of the unit and all its associated and museological information. It acts as a surrogate for the information unit and allows it to be manipulated in relation to other records (Hoffman 1976: 41-45; Orna and Pettit 1980: 7). This is a necessary prerequisite if the museum is to meet its service obligations (as was postulated earlier) (Hoffman 1976: 1; Orna and Pettit 1980: 6). An information system is the chief tool in the accomplishment of this service (Hoffman 1976: 5).

The actions have been summarised as the selection and acquisition of material, its description and indexing and finally the manipulation of the system to meet the users' needs (Turner 1987: 4-7).

The records and the requests for information will also determine the manner in which the records are organised. The structure or organisation of the information on the record is not determined by user requirements but by the nature of the record and the information itself. The only exception to this will be the record heading which is discipline determined. This is discussed in greater detail in Chapter 8: Descriptive Documentation.

The structure of the subject concepts is likewise the means used to organise the subject access points in the information system. This topic is discussed in greater detail in Chapter 9: Subject Documentation.

The aspect of the system which will be discussed here is the use of an alphabetic or a systematic approach in organising the records (Chan 1981: 125-128; Wynar 1980: 482-485). The manner in which

the records are organised should be determined by the output i.e. the functions the information is expected to fulfill.

7.7.1 The organisation of the information system

One must be able to retrieve the required information unit from a collection. Historically this was first done by organising the items themselves in certain ways (Turner 1987: 22). Later as the collection grew too large the record of the information unit was created to act as a surrogate for it: the item could be arranged in one sequence and the surrogates in a number of other sequences.

The objectives for these sequences of records are naturally the same as those of the information system as a whole, namely the management objectives of care and control of collections, use of collections and preservation of information and the identification of information units by name, group name, or subject. The management objectives were clearly stated by Roberts and Light (1980), Roberts (1985), and Light (1988). The identification objectives are similar to those enunciated for library catalogues which were first stated by Cutter in 1904 as:

- enable a person to find a book
 - to show what the library has on a given topic
- (Chan 1981: 128).

Comparison of this to the statement of museum information system objectives (Principle 2) shows that they are remarkably similar. Both systems require an information system to locate material and to collocate related material while the museum system is also required to preserve information (Chan 1981: 128; Roberts 1985: 25).

Each record in the information system is given one or more access points through which the record can be retrieved. The access point is presented in the form of a heading on the record, which is added to the description (Chan 1981: 85). In the library access is traditionally through author, title and subject (Chan 1981: 125). In the museum the traditional access points in the information system to the collection are through the item name, of group or the subject.

Two basic methods of arranging access to the collections have arisen; one is alphabetical and the other is systematic (Sharp 1968: 154). They may be described as follows:

- the alphabetical information system which arranges all records in one alphabetical sequence (known as the dictionary catalogue) (Chan 1981: 126).
- the systematic information system which arranges the records according to certain predetermined patterns of classification schemes, in which related subjects are brought together or associated with each other (known as the systematic catalogue) (Chan 1981: 125).

Examples of these different filing methods can be seen in Table 3 at the end of this study. Within these two basic types there are variations on the way it is done. No matter which one is used, it should cover the contents of the collection and guide the person who consults it to these contents. The differences between these two types lies in the arrangement and filing of the records. Table 4 at

the end of this study details the advantages and disadvantages of the two main methods of access organisation.

The systematic information system is one in which the records are arranged logically and systematically according to a particular classification scheme (Chan 1981: 125). This type of information system can cope with complex ideas; related material is collocated and any problems which might be experienced with homonyms and synonyms are avoided (Sharp 1968: 156). The ideas are organised in a systematic information system from the general to the specific (Chan 1981: 125). The systematic arrangement is usually done according to the division of knowledge within a classification scheme. This means the information system will also be influenced by the problems inherent in the philosophical system which underlies the classification scheme applied (Wynar 1980: 481).

The systematic information system functions very well in special situations, particularly those devoted to a single discipline, but problems may be experienced in marrying a series of different schemes for particular disciplines into a multi-media, interdisciplinary information system.

The other method of organisation is the alphabetical where records are arranged in an alphabetical sequence according to the access points recorded as headings. Two methods are recognised, namely the alphabetico-specific and the alphabetico-classed.

In the alphabetico-specific information system, the heading consists solely of the name of a specific subject and the records are arranged in strict alphabetical order according to the heading (Sharp 1968: 158). The relationships between specific concepts are revealed through relevant references and cross-references (Chan 1981: 126). A variety of techniques are used to achieve this, the most popular in museums being the thesaurus (Chan 1981:126; Orna 1983).

In the proposed multi-media, interdisciplinary information system for the museum, the strict alphabetical approach would mean that all the records for an institution would be filed in a single alphabetical sequence. In a medium or large size institution this could very rapidly become unwieldy. A solution might then be to divide the information system into a series of specialised groups, for instance according to collection (e.g.

costume), discipline (e.g. palaeontology), or aspect (e.g. date or person's name, or an alphabetical sequence of names and another of subjects (Chan 1981: 126)).

Two problems arise in the construction of an alphabetical subject information system; they are the form of the headings and the provision of a structure of references for material scattered through the alphabet (Sharp 1968: 161). Various attempts were made to produce rules for the construction of subject access points. Initially no-one recognised that subjects are complex and sophisticated rules are needed for forming the subject access points. These are discussed in greater detail in Chapter 8: Descriptive Documentation: Principle 5 and Chapter 9: Subject Documentation.

The systematic approach also has several problem areas which are discussed in greater detail in Chapter 9: Subject Documentation.

7.7.2 CONCLUSION

No matter which method of access organisation is used, it should cover the contents of the collection and guide the person who consults it to these contents. The difference between these two types lies in the arrangement and filing of the records.

CHAPTER 8

DESCRIPTIVE DOCUMENTATION

8.1 INTRODUCTION

Descriptive documentation is the creation of a surrogate record for the information system. It is a description of the information unit which is complete enough to serve as a surrogate for the information unit in the system.

The term descriptive documentation describes the process which is concerned with the identification and description of the item, the recording of it in the form of a record and the selection and formatting of access points, except subject access points (Chan 1981: 11; Wynar 1980: 17).

Descriptive documentation is concerned with a number of theoretical issues, such as:

- the reason for the record

- what information should be recorded and where it should be obtained
- a suitable terminology for the information items
- how the non-subject records should be accessed

These aspects are discussed in the following principles which it is hoped will act as guidelines in framing rules for descriptive documentation.

Identification and description are closely related processes in descriptive documentation. Identification consists of the choice of conventional elements, formulated by documentalists to describe the information unit. When these conventions are correctly applied they create a record which uniquely describes the item and it (the description) can be applied to no other information unit (Wynar 1980: 17).

8.2 PRINCIPLE 1: THE PURPOSE OF DESCRIPTIVE DOCUMENTATION

Suggested principle :The purpose of descriptive documentation is to provide a surrogate record of the information unit which can be manipulated to meet the users' needs (Turner 1987: 25).

Discussion :

8.2.1 The reason for the record : A museum houses a wide variety of information units which it wishes to use to support the different activities of the institution. In order to use them they must be accessible. If the physical arrangement of the information units in the system matches the retrieval demands of the users then there are few worries over the alternative ways users need to retrieve information. Thus if all user demands are for subjects that match the subject arrangement chosen, or all demands are for the report numbers, or accession numbers by which items are stored, the cost effectiveness of providing alternative approaches is zero (Turner 1987: 25).

Unfortunately life is not so simple. Whatever arrangement is used, it can only follow one particular chosen order, e.g. unit group, unit name, or subject. In many cases there will be demands for access points to items through other aspects e.g. title, material, date, subject. This need to provide access to the information units from a number of different points of view led to the creation of a surrogate for the information unit, which can be multiplied as often as required and arranged in different sequences (Hoffman 1976: 41-45; Turner 1987: 15).

This information stems from the item itself, either its physical form (e.g. book, table, or bird) or the information associated with it (people, places, events, dates). In order for the information to be useful it has to be recorded systematically; this implies an analysis of the types of information which occur, so that the surrogate is consistently useful (Hoffman 1976: 41-45).

The museum world has only recently realised that a record can act as a surrogate for the item in some circumstances and that the surrogate would benefit if it was constructed in a similar manner at all

times. Attempts to analyse the information on the record are being made by different bodies (M. Case 1987: pers. comm.).

The problem is currently being considered internationally by the Documentation Committee of the International Council of Museums but as yet no agreement has been reached on the matter. Nor is there agreement on the order or manner in which they are to be recorded.

8.2.2 Sources of information on the record: The first decision a documentalist has to make is what source of information should be used to compile the record (Wynar 1980: 18).

The source of information which is recorded in the information system is important. It will differ from information unit to information unit depending on the type of unit and the discipline to which it is connected. But it is important that a source is recognised and accepted by the profession because it affects the accuracy and acceptability of the data.

For bibliographic and documentary materials agreement has been reached within the respective professions and it is embodied in cataloguing codes

or professional handbooks. For example for books, manuscripts, printed music, and periodicals information on the title page is preferred; for microforms or films it is the title frame; for sound recordings it is the label and sometimes the container (Wynar 1980: 18). Usually the chief source of information provides the most complete bibliographic information.

For museum information units this problem is not so easily dealt with. For those items which are similar to library stock, the same rules can be applied. But for three dimensional information units, consensus has still to be reached in different disciplines on what the significant aspects are for documentation purposes. Broadly speaking the significant attributes of an information unit are the physical attributes of the item (i.e. its physical appearance), its associated information (the history, use, people, places, dates and events connected to the item) or its museological information (i.e. how it came to the museum, who brought it and when it entered the collection). (Southern African Museums Association. Documentation Group 1987: 5; Transvaal Provincial Administration 1977: v.IVA: 1-2; ; Wynar 1980: 18). The item can supply some of the information but not all as the

associated and museological information which by its very nature is not usually visible in the collection item itself, but accrues to it during its lifetime (Southern African Museums Association. Documentation Group 1987: 5). Users of the information system seek information under any one of more than fifteen possible access points, but usually it is by the specific name, group name of an information unit or by its subject.

Each discipline will have its own recognised sources of information, but these should be formally recorded so that the documentalist knows where the information should be obtained. This will assist with the recording procedure.

These discipline oriented deliberations should also stipulate the source from which the information for the headings for the record should be taken. For museum collections it is the discipline which will determine the most suitable type of element to be used as the heading e.g. for natural science or cultural history items the physical appearance or function will be the most likely element to be used, while for art works or documentary items the name of the person responsible for the creation will be the most likely suitable heading.

The source which should be used for the identifying information of museum items will depend entirely on the discipline concerned. Some will specify that the item itself should be used; others will specify the item plus a standard handbook on the topic while a third will specify a completely outside source (International Federation of Library Associations 1971: 30).

The structure of the record is considered in Principle 2 and possible access points in Principle 5.

8.2.3 CONCLUSION

The purpose of descriptive documentation is to create a record of the information unit which will act as a surrogate for it in the information system. The description should be accurate and complete enough to allow the users to choose and identify the unit(s) on the basis of the record (Turner 1987: 27).

8.3 PRINCIPLE 2: THE STRUCTURE OF THE RECORD

Suggested principle: The record must be structured to facilitate retrieval

Discussion :

8.3.1 The structure of the record: The structure of the record must be such that the item can be positively identified (Turner 1987: 25). In order to do this several aspects of the record should be examined namely:

- the content of the record i.e. the types of information found on the record
- the format of the record i.e. how the information can be most usefully arranged
- the record depth i.e. how much information should be recorded.

The final aspect of the record are the access points which can be identified from the information contained. These are considered in Principle 5 of this chapter and in Chapter 9: Subject Documentation.

In recent years there has been an enormous expansion in the use of computers in museum documentation (Museum 1988: 43). This has resulted in an increase of interest, and has, in some ways also compounded the problems mentioned in Chapter 3 in that more museums have started computerisation without the necessary preparation. The record is one of the perennial problem areas. It will be examined in depth in the ensuing section.

However before one does so several concepts from the information sciences should be introduced which are useful in discussions of the record, namely:

- data element: the smallest unit of information to which reference is made (Sarasan 1981: 46)
- data field: an area within the record containing a specified kind of information.
The information in one field is discrete

(Chenhall 1975: 37; Sarasan 1981: 46; Sarasan and Neuner 1983: 18)

- record: a series of related data fields. All the data fields pertaining to a particular unit, forms its record. A record in a manual system is usually a card (Chenhall 1975: 37; Sarasan 1981: 18)

- a data file or simply a file: It is a set of related records (Chenhall 1975: 37; Sarasan 1981: 46; Sarasan and Neuner 1983: 18)

8.3.2 Identification of information: As noted in Chapter 3 there is a great deal of variety in the information or data which a record might contain. When museum collection records were first computerised in the 1960's and 1970's no attention was usually paid to the data elements which make up a data field, or the data fields which make up a record. The categories on the manual record were input as is, and people found themselves with masses of data which could not be manipulated (Sarasan 1981: 45; Sarasan and Neuner 1983: 18).

The museum world found that the information on the record should have been analysed into its finest data element, then tagged or otherwise coded and the information which is entered into the information system analysed and tagged accordingly (Chenhall 1975: 38). This identifies all the information on the record clearly (Hoffman 1976: 41-45).

The analysis of the information categories is a task for the whole professional museum body so that consensus can be reached on it. In the library and archival fields this analysis was completed and agreed to some time ago (Chan 1981: 27-28; M. Olivier 1988: pers. comm.).

Attempts to analyse the information on the museum record have been made by several bodies (M. Case 1987: pers. comm.; Museum Documentation Association 1980a; Southern African Museums Association. Documentation Group 1987). The analysis of the information categories completed by the Southern African Museums Association Documentation Group and presented to the profession in 1987, identified four distinct groups of information.

- Identification information: This is the information which uniquely identifies the unit, i.e. its institutional code, accession number, name of the unit and its classification group (Southern African Museums Association. Documentation Group 1987: 5)
- Inherent information: This is the information contained in and derived from the physical description of the unit. It includes details of colour, form, measurement, material, structure, completeness, inscriptions, and mineralogy for example (Southern African Museums Association. Documentation Group. 1987: 5)
- Associated information: This is the information associated with the unit, but not directly obvious from its physical appearance, such as people, places, events, or dates, with which it is linked or which are attributed to the unit (Southern African Museums Association. Documentation Group 1987: 5)
- Museological or management information: This is the information which is required for the management of the item within the museum, such as details of acquisition, conservation,

valuation, locality history, utilisation history, and so on (Southern African Museums Association. Documentation Group 1987: 5)

The bibliographic record is seen to be composed of a series of "statements" of different kinds of information, (they are not listed in order of appearance or importance), namely:

- The heading : This is the main access point chosen for the unit
- The title and statement of responsibility:
This is usually the title of the unit and the name of the person, persons, or body responsible for it
- Edition statement: This contains information relating to the edition of the statement when it is available
- Publication statement: It gives details of the place of publication or distribution, name(s) of publisher or distributor, role of the place mentioned and name given, date of publication, and details of manufacture (place, name and date if available)

- Physical description: This statement supplies a description of the physical composition of the work (number of volumes, pages, illustrations and size)
- Series statement: The name of the series and the numbering
- Note area: Details of any further information relating to the item which might be of use to the user
- Standard number and terms of availability: The International Standard Book or Serial Number and any special details relating to the availability of the unit e.g. for hire
(*Anglo American cataloguing rules* 1978: 7-269; Landau 1966: 287- 288; Wynar 1980: 44-107).

These categories are particularly relevant to two - dimensional information units and are listed in the order in which they are to be recorded as internationally agreed to, for library catalogue information (*Anglo American cataloguing rules* 1978: 13-216).

The museum record content is only now being considered on an international level by the ICOM Committee on Documentation (CIDOC) (International Council of Museums. International Committee for Documentation. Standards Working Group. Meeting 1987). So for the museum world there is neither agreement on the information categories which must be recorded nor on the order in which such recording should be done. But already the common areas between data fields in libraries, archives and museums are being examined. Bearman (1989: 1) notes that there is an underlying commonality in the way in which museums, archives and libraries manage their collections. This is doubtlessly also reflected in their common record content e.g. all three have a heading, a physical description, and a classification grouping.

Once the potential information on the record has been identified, from a wide variety of disciplines and institutions, the content of the individual record in each institution should be considered. The data fields which are chosen will depend on the use which is envisaged for them i.e. research or management, or both. Each activity requires

different categories of information, and the purpose for which the record is constructed will determine the categories placed on it.

8.3.3 Record format: The record structure is the order in which the data fields are arranged and the sequence in which they are placed. The structure must be designed to make it easy for the user to get the information from the system when it is required and for the documentalist to create the record (Orna and Pettit 1980: 43). The most important elements should be placed at the top of the record. In a manual system they can be made highly visible by being written in capital letters (Taylor 1948: 3).

As already stated descriptive documentation is concerned with both description and identification (Wynar 1980: 17). For the convenience of the user the documentalist and designer of the format will try to place the most important elements at the top of the record. For collection items these important data fields will probably relate to the name of the item, or group of items, and the subject access points. For bibliographic units they will probably be the name of the author or title and the classification category (Wynar 1980: 17).

The decision to standardise the order of headings and data fields in the record is necessary as soon as records are completed with a view to indexing them. The form of the terms which occur regularly must be decided and variations listed e.g. "purchase" or "buy", one term must be chosen and any references made to it from the possible alternatives. Standardisation is also important for names (people and places), dates, localities and dimensions. Hence the efforts of the SAMA Documentation Group to develop suggested standards for these categories (Immelman 1984: 234). The need for standardisation has also given rise to attempts to formulate an international data standard for museum information (Light 1988: 10).

8.3.4 Record depth: Whatever the physical recording medium (card, microfiche or disk) adopted, the amount of information recorded in an information system record will depend partly on the subject field being dealt with, (some require more detail than others) and partly on the type of service required of the information system. The amount of information which is included on a record is known as the record depth.

There is frequently a need for different levels of information in the compilation or use of an information system. This should be provided for in any documentation code which is formulated, so that the documentalists may choose the level that provides the amount of detail relevant to that particular museum's users and at the same time meet the standards called for in any set of international documentation rules (Wynar 1980: 41).

It is suggested that two levels of description in the information system are recognised, one for general or smaller institutions and another for larger research oriented institutions (*Anglo American cataloguing rules* 1978: 14). The SAMA Documentation Group has developed suggested levels of recording in the standard they propose (Southern African Museums Association. Documentation Group 1987). The first level is called the Essential Information Categories and the second as the Recommended Information Categories. The Essential Recommended Information Categories are those which must be recorded in order to ensure the scientific validity of the unit while the Recommended Information Categories are those which will enhance

the value of the unit for research (Southern African Museums Association. Documentation Group. 1987: n.p.).

It is recommended that each discipline decide on the Essential and Recommended Information Categories for itself. The standards derived by different disciplines groups in South Africa are listed in the SAMA Documentation Group Standard (Southern African Museums Association. Documentation Group 1987).

As discussed earlier the information system can vary from being a finding list to being an index showing the relationships between units through copious indexing and the provision of many access points. Three levels of information coverage are recognised in the "Paris Principle" for libraries (*Anglo American cataloguing rules* 1978: 14-15; Chan 1981: 52-54). It is suggested the same principle be applied to museum documentation. The levels are:

(1) Short form or simplified record (1st level)

The information included on this record is only the information necessary to be able to identify the item. This includes the main heading, the accession number, a brief physical description

and mention of any associated information. It is comparable to the entry made in the accessions register, but is below that recommended for the Essential Information Categories (*Anglo American cataloguing rules* 1978: 15; Chan 1981: 53; Southern African Museums Association. Documentation Group 1987: n.p.).

(2) Medium form or selective record

The medium form or selective record includes the details mentioned in the simplified record and one or two more. It is equivalent to the Essential Information Categories. It also refers to the making of additional and analytical records in important cases. This type of record will obviously be more intensive in time and financial implications than the previous one, and should meet the ordinary curatorial and management functions (*Anglo American cataloguing rules* 1978; 15; Chan 1981; 53).

3. The full or descriptive record

This is the most complete record possible containing all available information relating to the unit. It corresponds to the Recommended Information Categories (Southern African Museums

Association. Documentation Group 1987: n.p.).

This type of record is costly as regards time and finance but does ensure a complete record for research or use in other museum functions. A research institution with sufficient staff and finance will opt for a full, descriptive record and all the associated indexes. This will meet the requirements of both the curatorial as well as the research and management functions of the information system (*Anglo American cataloguing rules* 1978: 15; Chan 1981: 53-54).

Examples of these different levels of descriptive documentation can be seen in Table 5: Different levels of descriptive documentation.

8.3.5 CONCLUSION

The structure of the information on the record is of vital importance to the success of the information system because this will allow information to be accurately located for utilisation. In the library world the factors affecting the content of the record have been established and recognised internationally for fully 50 years (Chan 1981: 12).

The archival record also seems to have an internationally accepted standard although it is not formally recognised by an international body.

In the museum world the lack of consideration of these issues caused many of the problems experienced in early efforts to computerise museum records (Sarasan and Neuner 1983: 9-20). However work in several countries over the last fifteen years have resulted in efforts to draft an international standard. This problem is being dealt with by the Standards Subcommittee of the Documentation Committee of the International Council of Museums.

8.4 PRINCIPLE 3: COMPONENTS OF A DESCRIPTIVE DOCUMENTATION SYSTEM

Suggested principle :The components of a descriptive documentation system are:

- the main record
- the additional records
- the references
- the analytical records

Discussion

There are several different kinds of records which can be used in an information system to guide and assist the user. The types and their uses are outlined below.

For each item there should be at least a "main record" giving all the particulars necessary for identifying it. Other entries may be additional records based on the main record and repeating it under other headings or indexes which direct the

user to another place in the information system; references which direct the user to related topics or units and analytical records which are separate records created for a part of an item for which a comprehensive record has been made.

8.4.1 Main record

This is a full record giving all the information necessary for the complete identification of the information unit (American 1973: 85; Harrod 1971: 407). It is the most complete record of the item made in the museum. On it will appear the information pertaining to the unit, according to the depth of information decided on. The information must be presented in order and form prescribed in the Code of Recording Practice of the institution concerned, under a standardised heading suitable for the unit or derived from the discipline concerned (International Federation of Library Associations 1971; Wynar 1980: 7).

The main record may include tracings of all other headings under which the record is to be represented in the information system (*Anglo American cataloguing rules* 1978: 567; Harrod 1971: 407). As it is used as a master record, it may bear the

tracing of related references and a record of other pertinent official data concerning the work (American Library Association 1973: 85).

The main record is divided into different sections of information in order to organise the information logically into an easily recognised order. For all museum information unit records each will consist of a heading and a description. The heading is the most important recognition element of that particular information unit; for a book it will be the author or title; for a collection item it will probably be the name of the item. The description will consist of different types of information arranged logically. For books it will be information such as the title, imprint or collation (Chan 1981: 48); for collection items it will be information such as the inherent information, associated information and management information (Southern African Museums Association. Documentation Group 1987: 5).

In considering the main record there are several assumptions which should be recognised. The first assumption is that there must be at least one record for every unit i.e. the main record which gives all the particulars necessary for identifying the unit (Harrod 1971: 407). It should be obligatory to make

a main record for every unit which then forms the core of the information system. This is not unquestioned practice in museums. The production of records other than the main record are optional and depend on the finances and policy of the institution concerned.

A second assumption is that the main record provides a means of positive identification for the units and that all known information relating to the item is recorded here (Harrod 1971: 407). The positive identification of the item will depend, for three dimensional items particularly, on the amount of information recorded in the physical description of inherent information categories. The question of the amount of information which should be recorded has produced two different schools of thought.

The one group considers that only those aspects of the inherent information which are not immediately obvious from a photograph or illustration such as an inscription on the underside of the unit, or the colouring of a natural history specimen which might fade after death, should be recorded. This view point is logical if there are excellent handbooks available for the definitive identification of the unit.

The second group considers that a complete description should be given. This is particularly necessary where no standard handbooks exist for the topic. This situation arises more frequently in the Human Sciences than in the Natural Sciences, which have good standard handbooks for most topics. In the Human Sciences there are not, as yet, generally accepted standardised descriptions of units - after all everyone knows what a table is. But once one moves into the cross cultural context it is not so obvious. A field basket on an English farm is not the same shape, size or material as a field basket on a Xhosa farm.

It would seem that the amount of detail required in the inherent information category depends on the discipline concerned. These two points of view are closely related to the discussion on the purpose of an information system. The first viewpoint supports the finding list approach and the second the collocation approach to system function (Wynar 1980: 15).

The idea of a main record was once all important, particularly when there was only one form of access provided by the information system, for example,

author's or item name or title. The ease of production of records that can provide multiple access points such as cards, but more especially those based on microcomputers, has meant that the concept of a main entry is less important. Many information systems now merely repeat the same amount of information about the unit under as many different access points as are required by the user. This obviously simplifies some of the decisions to be made during recording and requires a series of fairly basic decisions about how many access points can be afforded for each unit.

In manual systems the heading used on the main record is a very important element in the organisation of the information system and in the retrieval of the unit record. The standard heading is devised according to the rules of the discipline concerned. It is the word(s), name or phrase placed at the top of the record (*Anglo American cataloguing rules* 1978: 566). It provides an access point in the information system which determines the place of the record in the information system and groups related records together (Harrod 1971: 306). In systems which can afford to have only one record, the

heading of the main record becomes of paramount importance (Turner 1987: 29). The heading is discussed further in Principle 5 of this chapter.

It is suggested that the concept of a main record, under a heading providing identification according to the main identification element of the discipline concerned is important. The main record, which should contain sufficient information for a positive identification of the information unit, is important in a museum information system.

8.4.2 Added entry or additional record

Most information systems have a main record and multiple access points to that record for the sake of recording features not used as the main heading and which the user is likely to require. These additional access points are known as added entries or additional records (Chan 1981: 97). They are secondary records, under headings other than the one chosen for the main record, and are usually headed by the names of people, places, dates or events associated with the three dimensional units, or title, people's names, corporate headings, series and name-title headings in the event of two dimensional units (Chan 1981: 97; Wynar 1980: 6).

The additional records are based on the main record and repeat, under other headings, information given in the record (International Federation of Library Associations 1963: 28). They are intended to provide access to information units under some characteristic other than the one chosen for the main record. On a collection item record, this information usually comes from the associated or management categories. At no time should an additional record be made for information which does not appear on the record (Chan 1981: 97; Wynar 1980: 7).

If in doubt about making additional records, always make one. The only constraint will be the costs of producing extra copies of the record in a manual system or the storage of extra information in an automated system. Therefore a simple cost effective trade-off needs to be made between the likelihood of a user requiring the access point and the cost of providing it (Wynar 1980: 7).

There is an assumption, here, that an additional record relates to only one item, that is to the item recorded on the corresponding main record (International Federation of Library Associations

1971: 15). This is accepted recording practise and cannot be violated without drastically altering the nature of the information system.

The additional record can take the form of a complete copy of the main record, merely entered under another heading, or of an index entry referring the user to the main record (Harrod 1971: 29; Orna and Pettit 1980: 48). In manual systems an abbreviated form of the main record, under the heading of the additional record can also serve (Transvaal Provincial Administration 1977: v.IVA: 8).

In the computerised systems the access point is linked to the main record, and so the marginal cost of providing extra records is extremely low and as many additional records as the user might think of can be made (Cutbill 1973: n.p.). Low budget manual systems however, would have to consider very carefully the fairly high increased cost of providing a multiplicity of additional entries.

The simple principles of making additional records for functional use, physical appearance and intellectual responsibility for deciding on whether to make additional records or not, will not prevent

there being complicated decisions to make. For bibliographic material there are sets of rules in the international cataloguing codes (*Anglo American cataloguing rules* 1978: Rules 21.29-21.30: 322-325). However the basic idea that information systems are being produced to help users gain access to information should be the criterion on which decisions are made (Turner 1987: 30).

The form in which additional records are made will depend on the policy and facilities of each institution. For simple manual information systems a brief summary of the information on the record is entered under a different heading (Transvaal Provincial Administration 1977: v.IVA: 8). Though such additional records repeat information from the main record, they may omit parts not considered relevant in the particular place in the system (International Federation of Library Associations 1971: 15).

8.4.3 References

However carefully headings for the record are chosen, there will be cases where the users and searchers are unable to work out the heading or form of heading which has been chosen. Therefore from the

very beginning an information system must build in a reference structure to allow users to be led from the heading they have looked up to the one chosen by the documentalist. Eventually the user recognises the broad principles that have been used and learns which form to use (Turner 1987: 34-35).

The reference directs the user from the word or phrase not used as a heading to the one that was used (Harrod 1971: 538). It can appear in two forms, the "see" reference and the "see also" reference (Chan 1981: 117). It is a means of preventing the undue bulking of the information system which would result if additional records were put in for all synonyms or related terms. One reference will refer the user from the term not used to the correct term in the system (Norris 1960: 29).

"See" references lead the user from the terms which are not used in the system to the terms which are used. They are often made from variant forms of a name, or from synonymous terms for subjects, to the names or terms actually chosen for headings on records (Chan 1981: 117; Norris 1960: 27). The other form of reference is the "see also" reference which acts as a guide to further search referring the user from a heading under which records have been

placed to the heading where allied or related records may be found (Wynar 1980: 382). It is especially useful in creating interdisciplinary links:

e.g. Finance

see also

Investment

References of both kinds may be either specific (referring to one particular heading or even a particular unit) or general (indicating the kind of heading or a number of headings which should be consulted) (Landau 1966: 384).

In the museum references are used from one heading to another or from one form of heading to another. The heading may be the unit's name, associated information or subject. Thus unlike an additional record, a reference relates to all units which might be sought in one place in the alphabetical information system, but are in fact recorded in another.

Documentalists should ensure that references are made freely between alternative forms of headings to the chosen one. One must also ensure that every

reference is absolutely necessary and that it will serve a purpose in the information system. But the need for such references cannot be sufficiently emphasized.

8.4.4 Analytical records

These are bibliographical records which describe a part or parts of a larger unit (Chan 1981: 77). They are usually compiled for a distinctive part or parts of a collection, monograph or series that has been catalogued as a group with one main entry. This is done so that the part or parts can be traced in the system where the documentalist feels it is important for the constructive use of the system (Wynar 1980: 259-261).

8.4.5 CONCLUSION

It is suggested that the theories relating to main records, additional records, references and analytical records outlined above which have been derived from librarianship should be adopted by museum documentation as it definitely has been shown to be applicable, and museum documentation has no body of theory dealing with these matters.

8.5 PRINCIPLE 4: MULTIPLE ACCESS POINTS TO AN INFORMATION UNIT IN AN INFORMATION SYSTEM

Suggested principle: The record of an information unit should appear in the information system under a main access point and several secondary access points, if it is appropriate. There should be:

- a record for each information unit under an appropriate access point.
- when variations of this heading exist a standardised form must be chosen and adhered to
- appropriate additional records and / or references must be made whenever it is necessary in the interests of the user or because of the characteristics of the information unit.

8.5.1. Discussion

The suggested principle begs the question on several points of theory which have been derived from library and information science. The first is the conceptual division of the documentation procedure into a description and an access point or heading.

The text in the AACR 2 is divided into two distinct sections on this basis (*Anglo American cataloguing rules* 1978). It is a division which has not yet appeared in museum documentation manuals.

The second question is the distinction made between cataloguing and classification. Cataloguing is the creation of the record i.e. constructing the description and supplying suitable access points for authors, or titles (Chan 1981:90 ;Wynar 1980: 267). Classification is the creation of access points to the subject content of the work, either with verbal (subject headings) or numerical (classification codes) access points (Chan 1981: 83). The construction of author or title access points are controlled by the rules for descriptive cataloguing (Chan 1981: 83; Wynar 1980: 267). In museums there is no distinction made in either case: the compilation of the record, construction of access points and allocation of the subject categories are one and the same task.

The documentation record is given one or more access points through which it can be retrieved. On each record one access point is placed in a prominent

position to become the main access point (Chan 1981: 85). The others then become the headings of the additional records.

Principle 4 suggests that a record should appear in a multiple form with a main record under a main access point and additional records under other access points. The wide variety of information units in a multi-media, interdisciplinary information system poses problems here as each type will have its own recognised and required access points. For example the main access point of a bibliographic record is derived from the author's name or title printed in the book (International Federation of Library Associations 1971: 30-31). Other museum information units do not have formal statements available, but it is suggested that the main access point should be derived from the physical appearance of the information unit, the person or body responsible or the unit's subject content.

In the "Paris Principles" it is stipulated where the information used in compiling the main access point is obtained (International Federation of Library Associations 1971: 17). For library material it is internationally agreed that the title page should be the source of information. The source which is used

for the identifying information for museum collection units will depend entirely on the discipline concerned. Some will specify that the unit itself should be used; others will specify the item plus a standard handbook, while a third will specify a completely outside source (International Federation of Library Associations 1971: 30).

The second statement within this principle deals with the question of variant forms of the heading, and introduces the concept of using standard headings in certain circumstances (International Federation of Library Associations 1971: 17).

In the library context it is recommended that when the variant forms of an author's name or of the title occur "an entry for each book under a uniform heading consisting of one particular form of the author's name or one particular title, or, for books not identified by author or title, a uniform heading consisting of a suitable substitute for the title" be used (International Federation of Library Associations 1971: 30-31). This introduces the concept of choosing a uniform heading or standardised access point so that the collocation function of the information system can be achieved

by bringing together in one place in the information system, all the records relating to one information unit.

For museum collection items the statement is simpler, merely reminding the documentalist that there should be a standard form of an access point, when there are possible variants, and that a choice must be made and adhered to.

The first two statements in this principle is concerned with the records which are obligatory for each information unit. The third statement is intended to provide for further records which might be necessary in the user's interest, or because of the characteristics of the unit. But the wording of this statement can be criticised as being at variance with other parts of Principle 4 which is concerned with the use of multiple records, and not with the kinds of records necessary for a certain unit; this is dealt with in Principle 3.

8.5.2. CONCLUSION

The concept of multiple access points to an information unit record is shown to be applicable to a museum information system and the concept of standardised headings is introduced. These will be further explored in Principle 5.

8.6 PRINCIPLE 5: THE STRUCTURE AND FORM OF STANDARDISED ACCESS POINTS

Suggested principle:

5.1 All information units in an information system should be recorded under a standardised heading or main access point derived from the practices of the discipline or organisation concerned or the subject content of the record.

5.2 Records under other access points for the same unit or type of unit should normally take the form of additional records but references may be used, when it can replace a number of additional records under one heading.

5.3 Additional records or, in appropriate cases, references should be made under all information aspects not revealed by the chosen main heading, but considered necessary for retrieval.

Discussion

Principle 5 is concerned with the question of standard access points or headings for information units. This concept was vigorously debated at the 1963 IFLA meeting. The question of whether to use standard headings or access points or not, and deciding to do so. The type of access point which should be used will depend on who the information system is designed to serve and its intended functions (International 1963: 36). The decision at the International Conference on Cataloguing Principles in 1961 was that the cataloguing principles (for libraries) should be framed for a general research library (International Federation of Library Associations 1971: 24). In the museum context it is assumed in this study that the information system being discussed is for a medium-sized, research oriented institution.

8.6.1 Purpose

The heading or main access point on a record is the name, word or phrase placed at the beginning of a record to indicate some special aspect of that record (*Anglo American cataloguing rules* 1978: 566). It is used to determine the exact position of the

record in the information system and to group related records together (Harrod 1971: 306). And is the means used to gain access to the record in the information system when it is required.

The main access point serves both to identify the record and to collocate similar records together for the convenience of the information system user, as outlined in Principle 2.1 and 2.2 of Information Systems (Chan 1981: 99; Wynar 1980: 16). To achieve this the record must be framed in one "correct" form. This "correctness" is achieved through commonly agreed rules for the construction of a record heading or main access point and through agreement on the sources of information which are used to construct the record (Wynar 1980: 16-17).

In Librarianship this heading is referred to as a "uniform heading" (Chan 1981: 100). The term is used for headings derived from personal or corporate names of authors or from titles and are formed according to rules laid down in AACR 2 (Wynar 1980: 16-17). Headings referring to subjects are known as subject headings, index terms, index entries or descriptors (Vickery 1970: 62).

8.6.2 Choice of access points in general:

All information units in a museum information system can be placed under one of a range of possible access points derived from their records. The main access point and the secondary ones must be chosen. The main access point is then used as the heading on the record and the others are used as additional headings or index entries in the information system (Wynar 1980: 267).

There are three divergent types of access points which fall within this discussion. The first are the proper names of people, institutions, or places, the second are the names of three dimensional collection items and the third are subject access points. In traditional library practice the first two fall within the ambit of cataloguing and the third within classification or subject headings.

In museum information systems it is often extremely difficult to draw a rigid line between the item name and subject access points. They are different ends of the same continuum. In some cases too, the subject access point is used instead of an item name, for instance in documenting photographs. For purposes of discussion in this section therefore the

choice of subject access points will be discussed here, but their organisation in Chapter 9: Subject Documentation.

8.6.3 The variety of information units

A major problem for the museum documentalist is the fact that the proposed multi-media, interdisciplinary information system covers such a wide range of different types of information units. Some of these fields, such as archival material, bibliographic material and Natural History collections are already covered by codes and rules which prescribe how the main access points for the information units should be formed. For instance, bibliographic material is covered by the Anglo American cataloguing rules, 2nd edition (1978), Natural History collections are covered by the nomenclature codes in the different disciplines, based on the Linnaean nomenclatural system (International Code of Nomenclature of Bacteria and Viruses 1958; International Code of Zoological Nomenclature 1964; International Code of Botanical Nomenclature 1972).

Books and art works usually possess titles given by their creators (author or artist) and for most the title is a unique identifier. It is an individual name for a particular object (Abell-Seddon 1987: 3). This is in opposition to most museum collection information units which do not possess individual, unique titles or specific, creator-allocated names.

In museum collections most of the items do in fact possess names such as table, chair, or dog. But closer examination shows that these are names which denote their membership of a group, rather than identifying them as individual, unique objects (Abell-Seddon 1987: 4).

In the natural sciences this problem has largely been overcome by the use of the Linnaean nomenclatural system. The concept of species unites all those individual items which are considered to be so nearly similar as to belong to the same kind (Abell-Seddon 1987: 4). Natural historians have succeeded in making this a practical and workable concept, despite the intrinsic variety of living things (Abell-Seddon 1987: 4).

According to the Linnaean system each specific type of item is given a unique name. It is two-part or binomial. The first part (generic name) is shared by several species of close affinity while the second part (specific epithet) is reserved, in combination with the first part, to denote one species alone and no other (Abell-Seddon 1987: 5).

Principle 5.1 has been framed in an attempt to cope with this diversity and with the ruling codes of practice, hence the phrasing "derived from the practices of the discipline" (e.g. natural history), or "organisation" (e.g. library or archive) or "subject content of the record" (e.g. subject access points).

In the "Paris Principles" the equivalent principle is framed in far more specific terms. It reads:

"6.1 The main entry for works under author's names should normally be made under a uniform heading. The main entry for works entered under title may be either under the title as printed in the book, with an added entry under a uniform title, or with added entries or references under the other titles. The latter

practice is recommended for the cataloguing of well-known works, especially those by conventional titles".

"6.2 Entries under other names or forms of name for the same author should normally take the form of references; but added entries may be used in special cases".

"6.3 Entries under other titles for the same work should normally take the form of added entries; but references may be used when a reference can replace a number of added entries under one heading."

"6.4 Added entries (or in appropriate cases references) should also be made under the names of joint authors, collaborators etc. and under the titles of works having their main entry under an author's name, when the title is an important alternative means of identification".

These are the bases of the choice and form of access points for bibliographic and archival material discussed later (International Federation of Library Associations 1971).

It can be appreciated that these specifications are too specific to be stated as a general principle for all museum information units, but that their statement as guiding principles in a library information system is both helpful and necessary.

In a museum information system Principle 5.2 and 5.3 are useful guides to the construction of additional records or index entries and references. They emphasise that the main access point is only one of a number of access points recognised, and that the others should also be included in the system. While this is an elementary concept in bibliographic system development, it needs to be emphasised in the underdeveloped museum information systems.

It is suggested that where internationally recognised rules for the formation of names or access points exist, they be used. Bibliographic and manuscript material will use the Anglo American cataloguing rules. Natural history collections will

use the international nomenclatural conventions of the discipline concerned. For Human Sciences collections and general access points which do not fall into these two categories, there are no international standards.

8.6.4 How to choose from among possible access points

As seen there are several different types of codes and rules for selecting the record aspect which should be used as the main access point. But frequently one is faced with a choice within the data field, or there may be synonyms which the code does not always tell one how to deal with.

In 1904 an American librarian by name of C.W. Cutter suggested certain principles which can be applied to the choice of main access points in order to support the information system functions outlined in Chapter 6: Information Systems: Principle 2 (Chan 1981: 128; Wynar 1980: 486). Although they were originally framed to assist in the process of choosing subject headings, they are equally valid for the choice of access points in museum information systems. They can be summarised as follows:

8.6.4.1 The user as focus

The access points used in both wording and structure should be those which the user of the museum information system will seek (Chan 1981: 128-129; Wynar 1980: 486). Cutter regarded this as being of paramount importance in the design of an information system (Chan 1981: 128).

In the museum one assumes that the user will be of the research staff and that the terminology used in the system should be the scientific language of the discipline concerned. It is assumed that a closed group will use the subject access file of the information system. Where the public is given direct unassisted access to the system, the use of colloquial terms should be considered.

This principle generates considerable debate among museum documentalists when a decision must be taken pertaining to verbal headings or notation, to signify the subject concept access points in the system. Because the users generally find words easier to use, verbal headings are usually decided on, although a code can be more economical in expressing a concept and the documentalists find codes easier to work with. However the specific

"subject habits" of the information system users and the parameters of their specific subject requirements still have to be determined.

8.6.4.2 Usage

As discussed in Information Systems: Principle 2, a system must be designed to meet specific objectives, one of which is usually the specific needs of the user group concerned. A corollary of this idea is the principle that the access points in the system must represent the common usage of the users for whom the system is designed (Wynar 1980: 486). Common sense tells one that if this is not done, the system will be unable to meet its objectives because users are unfamiliar with the vocabulary use.

8.6.4.3 Unity of index terms

If an information retrieval system wishes to collocate information i.e. bring together under one heading all the information units which deal principally or exclusively with one concept, then the principle of unity must be implemented (Wynar 1980: 486). Collocation is essential if an

information system is to show all an institution's holdings on one particular topic in one place (Chan 1981: 129).

The idea of collocation can pose terminological problems. Therefore each concept is represented by one standardised term in the system; conversely, each term should not be used to express more than one concept. In general it is hoped that the term chosen is unambiguous and the one most familiar to the users of the information system. It is also a matter of economy because the use of a standardized term will reduce the number of entries in the system which would otherwise cause bulking (Chan 1981: 129). This is important in a manual information system, but not nearly so in an automated one.

This ideal poses a number of problems in practice because language is a flexible changing element which exhibits immense variety (Vickery 1970: 87). For instance, synonyms and homonyms cause problems (Chan 1981: 129). Cutter and others evolved different forms of control. They vary from lists of standardised terms to standardising the word forms which are used to nouns, not adjectives; the use of either the singular or the plural, not both; the use of either specific or generic terms, not both; or

the use of qualities and processes as qualifiers and the banning of synonyms (Vickery 1970: 87). The development of systems of references (see and see also) was also recommended (Chan 1981: 129).

The practice of standardized or "uniform headings" as an access point is similar to the bibliographical practice of choosing one form of an author's name if several appear. It has the added advantage that once a user is familiar with the form used, it facilitates communication within the system.

8.6.4.4 Specificity of index terms

The actual terms used should be as specific as possible (Wynar 1980: 486). When the term denotes a subject access point, it must be no broader than the concept it is intended to cover (Chan 1981: 131).

Cutter's rules are especially valid for the choice of access points for museum objects. But there are also three further approaches to constructing access points which must be considered when it is being done. Each access point must be examined:

- firstly as to the choice of the main access point

- secondly as to the choice of the form of the main access point
- thirdly as to the choice of the entry element (Chan 1981: 100).

In the following discussion each topic will be discussed under these three aspects.

8.6.5 Choice of access points for bibliographic and archival material

The choice of access points for bibliographic material is clearly defined in the Anglo American cataloguing rules (1978). These rules are based on the "Paris Principles" which state clearly that "the functions of the catalogue are most effectively discharged by an entry for each book under a heading derived from the author's name or from the title" (International Federation of Library Associations 1971: 92).

The Rules cover the choice of access points for personal names, corporate bodies, geographic areas and titles, as found in this type of material (Chan 1981: 100-115; Wynar 1980: 267-378). They indicate

which of the possible access points should be chosen as the main one; a further stipulation is that the other possible access points should be used as headings on additional records. Rule 21 deals with this matter (Wynar 1980: 267).

The access points for bibliographic materials are determined by the internationally accepted chief source of information or its substitute (Rule 1.0A). Other statements appearing formally in one of the prescribed sources of information should be taken into account, but the emphasis is to be on the chief source, making it unnecessary for the documentalist to search in the contents or outside the item for potential access points (Wynar 1980: 267).

The rules for bibliographic access points differentiate between those entered under personal name, under the name of a corporate body responsible for a work or under a title. The following discussion has followed these traditional divisions (Chan 1981: 90).

8.6.5.1 Personal names as main access point

A person's name is used as the main access point when he or she is "the person chiefly responsible for the creation of the intellectual or artistic content of a work" (Wynar 1980: 267). This can include composers, cartographers, photographers, performers and writers (Wynar 1980: 268). In the museum this is important for bibliographical, manuscript, and archival material and art collections.

8.6.5.1.1 Choice of the form of a name: After a name which is going to be used as a main access point has been chosen, the form in which it should be recorded must be considered. This involves the following aspects: fullness, language, and spelling (Chan 1981: 102).

The fullness of the name: A person's name can vary in terms of the fullness or completeness with which it is recorded. These may be the:

- number of elements involved
- e.g. Friedrich von Schiller instead of Johan Christoph Friedrich von Schiller

- in terms of the abbreviations used

- in terms of initials used

e.g. D.H. Lawrence instead of David Herbert

Lawrence (Chan 1981: 103).

The language of the name: A person's name may appear in many different language forms, e.g. Karl, Carlos or Charles. There are no clearcut criteria governing this choice. The basis of choice depends on the languages involved, the type of names (given or surnames) and the periods from which they date. In South Africa the choice will generally depend on the language of the catalogue, even though there is a strong international preference for English forms and Latin and Greek forms over vernacular ones (Chan 1981: 103).

The spelling of the name: If the same name may be spelt in several different ways, a choice must be made on the one to be used. Preference should be given to official orthography or predominant spelling (Chan 1981: 103).

8.6.5.1.2 The choice of entry elements for name:

Once the form of the name has been decided for a main access point, a decision must be made on which element in the name will be used as the entry element. This is particularly important when the name consists of several elements (Rule 22.4) (Wynar 1980: 313-315).

Most people in modern society are entered under their surname, but some surnames are compounds or contain prefixes. In such a case one of the words of the surname is chosen as the entry word (Chan 1981: 103).

e.g. van der Merwe can be entered under van, or
Merwe, Van der Merwe, or Merwe, van der.

Nobility and royalty frequently do not have surnames, in that case the general principle is to use as the entry word, the person's choice if it is known, or as they are listed in authoritative alphabetic lists in his/her language or country (Rule 22.12) (Chan 1981: 103). For titles of

nobility, terms of honour or for saints or spirits the title or honorific is added after the name (Rule 22.12 - 22.13) (Chan 1981: 103).

8.6.5.2 Corporate body as main access point

When a corporate body is responsible for the creation of an important unit, the name of the body is used as the main access point. A corporate body is defined as "any organisation or group of persons that is identified by a particular name and that acts, or may act as an entity" (Wynar 1980: 268). By this definition a corporate body may be a committee, firm, administration, association, conference, ad hoc event, (such as exhibition, or festival), vessel (e.g. spacecraft), radio or television station, non-profit organisation, government, religious body, or local church (Chan 1981: 108).

The general rule is to "enter a work emanating from one or more corporate bodies under the heading for the appropriate corporate body if it falls into one or more of the following categories :

- a) those of an administrative nature dealing with the corporate body itself, or its internal policies, procedures and/or operation, or its finance, its officers and/or staff, or its resources (e.g. catalogues, inventories, membership directories)
- b) some legal and government works of the following types : laws, decrees of the chief executive that have the force of law, administrative regulations, treaties, court decisions, legislative hearings
- c) those which record the collective thought of the body (e.g. reports of commissions, committees etc, official statements of position regarding foreign policies)
- d) those that report the collective activity of a conference (proceedings, collected papers, etc.), of an expedition (results of exploration, investigation etc.), or of an event (an exhibition, fair, festival etc.) falling within the definition of a corporate body provided that the conference, expedition, or event is prominently named in the item being catalogued

e) sound recordings, films and video recordings resulting from the collective activity of a performing group as a whole, where the responsibility of the group goes beyond that of a mere performance, execution ,etc." (Wynar 1980: 268 - 269) (Rule 21.1B)

Corporate bodies frequently change their names. When this happens a decision must be made on how the corporate body will be represented in the information system. In this case the principle of uniform heading is suspended. The new name is used as a separate heading and works are entered under that name as the main access point, from the time it comes into effect, with references to the other names (Rule 24.1) (Chan 1981: 109).

8.6.5.2.1. Choice of the form of the name: A corporate body may change its name but the principle of uniform heading generally applies, in that one of the variant forms is generally chosen, with references from the other forms (Rule 24.1) (Chan 1981: 109).

The fullness of the name: If a name has appeared in various degrees of fullness, the criteria for choice, in order of preference are:

- the form found in the chief sources of information
- the predominant form
- a distinctive brief form (initials or acronym.)

(Rule 24.2-24.3), (Chan 1981: 109).

The language of the name: The basic rule is to use the language of the catalogue, but AACR 2 has a strong preference for English, especially in the case of ancient and international bodies, religious orders and societies and governments (Chan 1981: 110).

The spelling of the name: If the form of name varies in spelling, the following criteria, in order of preference, are used:

- the form resulting from an official change in orthography

- the predominant spelling
- the spelling found in the first item catalogued (Chan 1981: 110).

8.6.5.2.2 The choice of the entry element:

When a corporate body is entered directly under its own name, the entry element is the initial word in the name. The exceptions are those names which begin with an initial article, ordinal number or terms denoting royal privilege.

Corporate bodies which are subordinate or related bodies or government bodies or officials are not entered under their own name. Special rules (Rule 24.12-20) are framed to cater for these (Chan 1981: 111-113).

8.6.5.3 Choice of title as the main access point

For bibliographic material, a process of elimination applies: works which have not been entered under the name of a person or a corporate body are placed under the title as the main access point (Chan 1981: 95). In other words a work is given a title main access point when:

- " 1) the personal authorship is unknown (see Rule 21.5), diffuse (Rule 21.6C) or cannot be determined and the work does not emanate from a corporate body
or
2) it is a collection or a work produced under editorial direction (see Rule 21.7)
or
3) it emanates from a corporate body but does not fall into one or more of the categories given in Rule 21.1B2 and is not of personal authorship
or
4) it is accepted as a sacred text by a religious group"
- (Rule 21.1C) (Wynar 1980: 270).

However there is also the convention of the "uniform title" in library catalogues for works which appear under more than one title so that they are brought together in one place i.e. collocated (Wynar 1980: 365). A uniform title is defined as:

"the particular title by which a work that has appeared under varying titles can be identified for cataloguing purposes" (Chan 1981: 113-114).

The occasions when a uniform title should be used are clearly spelt out by AACR 2 in Rule 25.1: Use of Uniform Titles

" the need to use uniform titles varies from one catalogue to another and varies within a catalogue. Base the decision whether to use uniform titles in a particular instance on:

- how well the work is known
- how many manifestations of the work are involved
- whether the main entry is under title
- whether the work was originally in another language
- the extent to which the catalogue is used for research purposes"

(Wynar 1980: 366).

Rule 25 of AACR 2 spells out the rules for uniform titles in general, as well as providing special rules for certain types of material such as

manuscripts (Rule 25.3 and 25.14), legal material (Rule 25.15 -25.16), sacred scriptures (Rule 25.17-25.18), liturgical works (Rule 25.19-25.24) and music (Rule 25.25-25.36) (Wynar 1980: 366). The rules for uniform titles are divided between individual works, collections, and the rules for special materials. However the extent to which these rules are applied depends on the policy of the cataloguing agency (Chan 1981: 114).

8.6.5.3.1 The format of uniform titles:

The uniform title is used as the main access point, placed as the heading on the record. It occupies the same position as the author heading (Chan 1981: 114).

The form of the uniform title: The criteria in order of preference for choosing the title to be used as the uniform title are:

- title by which the work is identified in modern reference sources
- the title most frequently found in modern editions

- the title most frequently found in early editions
 - the title most frequently found in manuscript copies
- (Chan 1981: 114).

The language of the uniform title: the title should be used in the original language, except for a work originally written in classical Greek or in a language not in the Roman script, when a well established English title is preferred (Chan 1981: 115).

8.6.5.3.2 Entry form of the uniform title:

Use the standard form of the title decided on, entering it under the first element of the standard title.

8.6.5.4 Conclusion

It can be appreciated that the rules of the AACR 2 developed over a period of time to cope with the problems presented by bibliographic material, are entirely equal to the task of providing consistent and standardised records for bibliographic material

if they are consistently applied. It is strongly recommended that the museum world be made aware of these rules and of the advantages of applying them.

8.6.6 Choice of access points for subjects

Access to the subjects in an information system is extremely important for any museum. The quality of the research done in the institution will often depend on the detail of subject specification in the information system available to the researcher.

Subject access can and should be approached from two different angles. The first is the obvious one of choosing subject access points from the information unit records which the user will require. This corresponds to traditional classification practice in libraries and is the type discussed in Chapter 9: Subject Documentation. The second angle is the use of the item name as the heading and main access point of the record. The item name is the most specific level of a nested, hierarchical classification or subject documentation system. It is seldom that a subject access point is chosen as the main access point and heading of a record in traditional library practice, however it is the norm for museum information systems.

8.6.6.1 Subject access points derived from the subject content of a record

The use of subject access points to reveal the subject content of information unit records can cover a wide range of topics. Orna and Pettit (1980: 33) suggest that subject interests in a museum information system will deal with persons, entities, events, products of industries or crafts, concepts, properties, materials, processes, operations, manufacture/production, places, time, and bibliographical details. Experience has shown that a museum requires chronological, geological, historical, technological, topographical, and typological indexes.

Both these purposes are equally valid and both produce subject access points of differing levels of speciality or generality which have to be organised by the subject documentation system.

In this section, the selection and form of subject access points will be discussed, while the theoretical issues of their organisation are discussed in Chapter 9: Subject Documentation.

8.6.6.1 Technical aspects of subject access points

In selecting subject access points there are several technical aspects, derived from library and information science, which must be considered.

The first is the term "Subject access point" which has been coined by this author. It is used to mean any word or symbol which is used as a subject indicator on an information unit record. It may be verbal or coded. Verbal subject access points were previously called subject headings in library parlance and were drawn from pre-co-ordinated standardised lists (Wynar 1980: 485). The notation code of a bibliographic classification scheme is also a subject access point (Harrod 1971: 622). Its purpose remains that of bringing together all the material with the same theme in one place in the information system (American 1943: 136). This is identical to the functions of access points discussed earlier but is limited to subjects.

When the subject access points in a record are to be selected, a number of decisions must be made which will affect the system.

They are:

- whether term or item entry will be used
- whether derived or assigned indexing will be used
- whether the technique of term indexing or concept indexing will be used.

8.6.6.2.1 Term or item record

A decision must be taken in the early stages of planning the information system as to how the records of the information units will be accessed. There are two options: The record may either be accessed by an entry representing a single information unit known as an item entry or it may be listed under a concept name known as a term, feature or an aspect record (Foskett 1977: 27-28). The item entry is a complete record of a single information unit recorded under a heading (Buchanan 1976: 79). The record carries details of the information unit in a standard sequence; the records are then arranged in a sequence according to the chosen characteristic or heading (Orna and Pettit 1980: 77).

The term record is a record for each concept used in the system as an access point (Buchanan 1976: 13). It involves the use of a discrete record to represent each concept (Kent 1966: 44). On the record, identity codes represent the information units which contain the concept sought (Buchanan 1976: 13). The term records may be arranged in a single alphabetical sequence by name of feature or item or grouped according to the name of a feature or particulars kind of features, such as people or place names, material, historical events (Orna and Pettit 1980: 77).

Conclusion:

The option chosen is important in the file structure of the information system. In a manual system the organisation of the catalogue i.e. alphabetical or systematic, and its equivalent i.e. the file structure in an automated system, will determine which of these approaches is used. Term records appear to be used chiefly in post - co-ordinated automated systems (Vickery 1970: 134-135).

In museums, in both manual and automated systems, item records have been used to date, even though Lewis (1965) suggested the use of term record

systems. Until experimentation or practice in another context shows remarkable advantages for term records, it is suggested museums should continue to use item record systems.

8.6.6.2.2 Derived or assigned indexing

The decision which has to be taken in this case is the means by which the access points will be established.

In the library context the documentalist has a choice of how to arrive at the terms used in the system: terms can be either taken straight from the documents themselves or suitable terms can be applied. The former is called derived indexing and the latter assigned indexing (Foskett 1987: 42, 58).

Derived indexing has been popular since automation became readily available. It was hailed by indexers as a liberator. And experiments followed to see if methods of automatic indexing could not be developed, using the vocabulary found in the information units themselves (Turner 1987: 134). It is called derived indexing i.e. where one is indexing directly from the information unit itself (Foskett 1977: 42). It uses a natural language or

uncontrolled vocabulary. The terms are selected by the computer according to pre-programmed criteria. The result is an index string for each information unit which is usually far longer than if it had been compiled by an indexer (Turner 1987: 135).

These terms create a very large database which is searched in post co-ordinate fashion using "Boolean Logic" (Turner 1987: 135). Experiments with this method are catchword title indexing, keyword-in-context indexing, keyword-out-of-context indexing and citation indexing (Foskett 1977: 43-56). These methods would appear to be unsuitable for museum application because they are limited to documentary materials.

The alternative to derived indexing is assigned indexing i.e. where terms are chosen to encode the subject content of the information unit and are assigned to represent it in the system (Foskett 1977: 58-59). Not only are the terms chosen, but their form (singular or plural) is noted, as are alternate forms (synonyms and homonyms) and relationships between terms (Turner 1987: 134).

This is a complex operation and guidance is needed to execute it consistently and successfully, hence the development of controlled and structured vocabularies which list words, showing their relationships and indicating ways in which they can be combined (Foskett 1977: 58). The procedure ensures consistency and brings together related material for the user, irrespective of the context in which the individual unit may occur (Turner 1987: 134). Assigned indexing is eminently suitable for use in a museum information system because it allows concepts to be co-ordinated from a number of different sources and is not applicable only to documentary material.

Conclusion

It is suggested that an assigned indexing system be used in museums because the same method can then be used for all information units. Furthermore the more structured format of this system appears to be beneficial in a system which will be used extensively by researchers.

8.6.6.2.3 Term indexing versus concept indexing

The third choice which has to be made is between term indexing and concept indexing.

Term indexing is the use of unmodified terms, drawn from the source document, as the index vocabulary. This is the same process as natural language indexing (Foskett 1977: 42; Turner 1987: 134).

Concept indexing is the identification of subject concepts in an information unit, and the subsequent application of a standardised term to those concepts (Buchanan 1976: 40). It is usually also the recognition of different relationships between concepts (Turner 1987: 134). A concept is defined as an idea of a class of objects, and is denoted by a term (Foskett 1977: 59).

Experimentation with term indexing in the library world has shown that, as with derived indexing, it leads to large uncontrolled databases (Turner 1987: 135). It is also limited to two dimensional recorded information units. Because of this it is recommended that concept indexing is used in museums, since it is applicable to both two and three dimensional

information units as well as creating a structured database which is extremely useful in a research context.

8.6.6.2.4. Conclusion

As can be seen, the series of choices which have to be made are vitally important. It is suggested that, for a museum information retrieval system, the following choices will produce the desired type of system.

- item entry (because it is the format museums are most familiar with and a change of orientation would prove very difficult for them).
- assigned, concept indexing (because it produces a structured retrieval system which is more useful in a research context).

These decisions on the type of subject access points which will be made should produce access points which will allow maximum retrieval of information and flexibility of growth in answer to changing research needs.

8.6.6.3 Types of subject access points

The decisions having been taken on the technical type of subject access points which will be used in the system, it is necessary to look at the types of subjects which will be covered. Obviously this will depend to a large extent on the disciplines represented in the museum. As mentioned they can be divided into general access points and those linked specifically to the nomenclature of the collections in Natural and Human Sciences.

General subject access points fall into different categories such as persons, events, products, materials, places and time (Orna and Pettit 1980: 33). These should be stated as specifically as possible for each record and then nested into logical hierarchies as they accumulate. Provision should also be made for synonyms and homonyms in the system. The most favoured form of system in the museum for linking these concepts appears to be in a thesaurus (Orna 1986: 64-69; Immelman 1980). Unfortunately no general thesaurus for use in museums has yet appeared.

8.6.6.3.1 Access points in Natural Science.

The nomenclature of natural science collections, as already discussed is well catered for in terms of the Linnaean system and the respective international codes of nomenclature which exist for different disciplines. They are based on the concept of groups possessing certain features in common, descended from a common ancestor, which are called species. Each species is given a binomial unique name (Dr.B.Stuckenberg 1980: pers comm.). A hierarchy of terms linked to concepts has been constructed on this base. As Abell-Seddon (1987: 4) remarks it works very well. For this reason it will not be discussed further, except to refer the reader to the international codes of nomenclature mentioned in the bibliography.

The need for general subject access points in the natural sciences should not be ignored. It is assumed that a well constructed thesaurus will meet requirements here too.

8.6.6.3.2. Access points in the Human Sciences

In the Human Sciences there is a desperate need for a system of nomenclature and classification, which will be understood and used internationally. It will seldom be possible to apply a specific and individual name to an item such as happens with titled artwork where the appellation is unique. The most one can usually do is apply a specific name to an object which links it to a small specific group (Abell-Seddon 1987: 6).

The importance of a name

A system of nomenclature is devised to ensure an efficient, unambiguous way of naming items (Dr.B.Stuckenberg 1980: pers comm.). It is neither absolute nor unalterable: rather, the name of an item is merely a handy tag by which to refer to it, so that all within one study area know without doubt what is being discussed.

The relationship of nomenclature to subject documentation

The name of an object should be a specific, unique appellation recognised internationally within the discipline concerned for that particular item. In museum information systems there are several "nomenclature" systems which operate in different disciplines and for different types of material. For example bibliographic and archival material can be "named" on the records according to the rules for uniform titles in AACR 2 and natural history material according to the nomenclatural code of the discipline concerned. In the Human Sciences, unfortunately there are as yet no such internationally recognised codes.

The relationship of the name of an item to its subject grouping is neither mysterious nor difficult to understand. The name of an item is the most specific form of grouping found in an information system. Its subject grouping is the most general. The subject access points assigned to the record during subject documentation can vary between these two extremes. The sole purpose of subject documentation is to group like material and separate

the unlike. The individual items in a collection are recognised by their descriptions on the respective records which pinpoint an individual in the general group.

Names in the Human Sciences

It is suggested that the Human Sciences should consider adopting a binomial nomenclature system for three dimensional items in museum collections in different disciplines. It will be composed of a general name and a specific name. The general name will denote a broadly recognised group or set of objects, equivalent to the generic name in the Natural Sciences. The specific name should be descriptive of a particular smaller group of objects, providing a specific, unique appellation. It is equivalent to the species name in Natural Science. The specific name designates a subset within the general group. However the use of a binomial system comparable to the Linnaean one does not imply a similar theoretical base. As evolution is the theory behind the Linnaean nomenclature system, it would appear that function or physical appearance could be a useful theoretical base for the Human Sciences.

The characteristics of names

The names should be brief, telling and as euphonious as possible. The names used within a general family group should be as varied as possible.

Any name which is applied to an information unit provides a label for it which helps to ease communication between workers in the same field. Any name which is applied should comply with three important prerequisites:

- uniqueness: it must give the researcher or curator a unique name by which the item can be referred to. The name of the item gives direct access to the information relating to it. If synonyms have been used by different workers for the same type of item it can cause confusion so there should be an agreed method within the discipline by which a name is decided. Normally priority decides in the case of conflict.
- universality: it is important that the international community in a discipline should establish a procedure for recognising names of

items. Communication between colleagues in the same field can be very difficult unless a single standardised system is used.

In the natural sciences Latin was adopted as the nomenclatural language, but this is not feasible in the Human Sciences. At the moment it appears that well constructed lists, well translated in the vernacular will serve the purpose.

- stability: Names are symbols for the easy recognition of items, but they will lose much of their usefulness if they are changed frequently or arbitrarily. This would, furthermore, cause confusion in the discipline and so hinder its development.

The curator and the researcher demand a system that will do two things for them: the first is to enable them to refer to particulars of an item under discussion, knowing that everyone will recognise the type of item being discussed. The second is to enable them to present the results of any research in an ordered and comprehensible form. By using standardised names they can be sure that other colleagues will understand.

In the Natural Sciences the names are published to make them internationally known. The name appears in Latin with a definition and a list of all possible synonyms. The description is at least a paragraph long and details all features that will enable both comparison with, and distinction from, other related items of close similarity (Abell-Seddon 1987: 5). Researchers in the Human Sciences should consider introducing this procedure.

Problems in giving names

Establishing the names of items can be problematic. A descriptive name which highlights an important feature of the item, or a geographic name indicating a specific locality connected to the item, can result in the literature being overburdened by the same name for different specific types of objects in the same general group.

The use of patronymic and mythological names should be avoided as their only virtue is that they ensure variety but lack any descriptive powers. It is also suggested that the researcher refrain from using miscellaneous names which have no definite meaning or are formed by an arbitrary arrangement of letters.

The language of names

As with the names for bibliographical items, the documentalist must decide on the language of the information system. In South Africa, both English and Afrikaans are used. When names are being framed it should be done in the vernacular of the researcher. Suitable translations into other international languages will occur with time if the proposed names are accepted.

The following is an adaptation of the International Code of Zoological Nomenclature (1964) suggesting rules by which names can be constructed for objects in the Human Sciences.

Code of nomenclature for the Human Sciences

Introduction : The object of the code is to promote the stability and universality of names used in the Human Sciences, in museum information systems and publications and to ensure that each name is unique and distinct. The ideas contained in the following rules are subservient to these ends and none should restrict the freedom of the researcher.

Rule 1: The nomenclature used in the Human Sciences is a system of accepted names which apply to groups of similar objects, where the similarity is defined by function or physical appearance, which are known to occur as the product of the cultures of man.

Recommendation: It is advisable to avoid using names with specific ethnic connotations, more general descriptive names should be chosen.

Rule 2: The name of the object is constructed on two levels, the general and the specific. The general name usually signifies a group or set and the specific name an individual subset or type of object within that group. They are usually singular or compound words.

Rule 3: The accurate designation of objects is usually uninomial in a simple or compound form for all general names and binomial for all specific names. Sub-specific names may be trinomial.

Rule 4: The name for an object or group of objects is to be obtained from the vernacular of the area in which it originated. If a translation into an international language will give a more generally understood term, this should be done.

Rule 5: All the names have the same value in the nomenclatural system.

Rule 6: A general name should consist of a single word, simple or compound, written with a capital letter and employed as a substantive in the nominative singular.

Rule 7: Specific and sub-specific names are subject to the same rules and values as others.

Rule 8: All specific substantive names must be written with a capital initial letter, if used alone, or a small initial letter if used in conjunction with the general name.

Rule 9: Specific names are:

- adjectives that agree grammatically with the generic name
- substantives in the nominative in apposition with the family name
- substantives in the genitive

Recommended: If it is necessary to define an object by name further than the specific name level then a name of three words can be used. This "sub-specific" name should consist of the two words of the specific name plus a third for more precise identification of the object. The concept of the "sub-specific" name has not been extensively or consistently applied in the naming of objects.

The application of the suggested system

The former Typology Section of the Transvaal Provincial Museum Service applied these ideas to the former typology project (a project to standardise the names, classification categories, and physical descriptions of items) with considerable success. The names framed in the vernacular on a general and a specific level, subsumed within a broader subject classification system, provided museum staff with a standard terminology.

8.6.7 CONCLUSION

The museum information system has several different types of identifiable access points. It is strongly suggested that, where possible, recognised

international standards , codes and rules should be used. Where they are not available rules should be formulated and rigorously applied, but care must be taken not to "re-invent the wheel" unnecessarily.

CHAPTER 9

SUBJECT DOCUMENTATION

As already discussed, subject documentation is an extremely important aspect of an information system because it gives the user access to information contained in, and relating to the information units which cannot be revealed through the name of the unit or the person who created it e.g. author of a book or artist of a painting.

Subject documentation has already been defined as: "The provision of a logical and meaningful system for the identification of information required by the user and to transform unorganised concepts, impressions or data into recognisable objects and recurring patterns which simplify the process of thought and are retrievable" (Chapter 6: Information Systems: Principle 1; Buchanan 1979: 10; Classification 1971: 1; Langridge 1973: 15).

9.1 THE SUBJECT APPROACH

In museums the users are primarily interested in subjects, of different kinds and at different levels of generality, or specificity. Therefore the information system must provide access through subject to all the information contained in the system.

The information is held in the collections and collection records, the documents, manuscripts and library of the institution and the previously defined information units. The real value of the system will only be realised when the information can be retrieved from any one of these areas on an interdisciplinary, multi-media basis. This is called the subject approach.

The subject approach in documentation is one aspect of the task of documentation and can be called "subject documentation". This term is drawn by analogy from the term "subject cataloguing" used in librarianship. The term subject documentation is used to differentiate it from "descriptive

documentation" which is the descriptive or cataloguing phase of documentation. This is the term suggested for use in museums.

The following section is a study of the subject retrieval methods used in librarianship and information science. The possible application of such methods to the museum situation, is examined. There will be few direct comparisons to museum practice because there is no formal museological theory for the creation of structured information retrieval systems of classification schemes (Orna 1980: 12). Museums with collections in the field of natural history use the existing classifications in such disciplines as botany or geology (Orna 1980: 13).

The subject coverage of museum collections is largely an unknown factor because it has not been properly organised to date, nor has its potential ever been properly utilised. The development of subject documentation is necessary, precisely because the museum is an important research institution which is under utilised. And in such a situation information is required at greater depth and breadth than most other situations demand.

The following is a group of four principles which it is hoped will provide the necessary parameters for the development of subject access in a museum information system.

9.2. PRINCIPLE 1: THE PURPOSE OF SUBJECT DOCUMENTATION

Suggested Principle: The purpose of subject documentation is to reveal the subject coverage of the collections. This is achieved by analysing the subject concepts and organising them into a retrievable system.

1. The reason for subject documentation is to organise unorganised subject access points so that they can be retrieved when needed.

2. The purpose of subject documentation is to enable relevant subject matter to be found when needed and to show a collection or an institutions holdings in relation to a given subject.

3. The objectives of subject documentation are :

3.1 To provide access by subject to all relevant materials

3.2 To provide subject access to collections

3.3 To ensure the collocation of related material
and separation of like from unlike.

3.4 To show affiliations between subject fields

3.5 To provide entry to any subject field at any
level of analysis

3.6 To provide entry through the users vocabulary

3.7 To provide formal description of subject
content

9.2.1 The reason for subject documentation

The reason for subject documentation in a museum is to organise the knowledge embodied in the information units within the system into a logical and meaningful system for the identification of information requested by the user (Turner 1987: 7). It places unorganised concepts, impressions or data into a pattern which simplifies the process of thought (Buchanan 1979: 10). This is generally accomplished by means of different methods of subject documentation. The procedure is essential if communication is to take place between the system and the user (Classification 1971: 5): it is also

the means used to access the intellectual and subject content of the collections, the relationships between these concepts, and the collections themselves.

9.2.1.1 The purpose of Subject Documentation

The purpose of a subject documentation system was succinctly stated as being to:

- enable a person to find an item or information unit linked to the subject being researched
- show the museums holdings (items or information) in relation to a given subject (after Chan 1981: 128)

This is accomplished through the provision of a logical and meaningful system for the identification of information required by the user and by transforming unorganised concepts, impressions or data into recognisable objects and recurring patterns which simplify the process of thought and are retrievable (Buchanan 1979: 10; Classification 1971: 1; Langridge 1973: 15). These objectives were

first enunciated by C.A. Cutter in 1904 for subject catalogues in libraries but they are equally valid for museums today.

9.2.1.3 The objectives of Subject Documentation

The objectives of the subject approach to information systems have been well summarised by Shera and Egan (1956: 10). The following is an adaptation of these objectives from the library to the museum context. They are:

- 9.2.1.3.1 To provide access by subject to all relevant material in a department, institution or group of institutions (Shera and Egan 1956: 10; Wynar 1980: 480).

It is important to stress the cross-media nature of a museum information system, if it is to warrant the financial investment implied in this statement. Implementation of subject access can be costly in staff time and equipment, especially if automated equipment is used.

9.2.1.3.2 To provide subject access to collections and data through all possible suitable principles of subject organisation e.g. matter, process, entity, concept etc. (Orna 1980: 46; Shera and Egan 1956: 10; Wynar 1980: 480).

When considering subject access and the problems it causes in the museum two factors should be borne in mind, one is that museums have never fully explored the subject potential of their information units, in an information system. Nor have museums examined tried and tested methods of library and information science in this field. Through ignorance the museum world today may well try to re-invent the wheel.

9.2.1.3.3 To ensure the collocation of related materials regardless of disparities in terminology and physical form (Shera and Egan 1956: 10; Wynar 1980: 480).

It is not clear from this statement whether the collocation referred to is the physical grouping of units in the storerooms according to a subject facet or whether it refers only to a grouping of the surrogate records. As already stated it is not feasible in museums to group the information units

physically according to the subject. The collocation referred to here is that of the surrogate record. It is a feasible and extremely useful modus operandi.

In museums the collocation of multiple copies of the record under different access points has only recently been generally accepted. This was due partly to a lack of the development of descriptive documentation theory and the combination of a lack of finance and staff to run a multiple-record manual system. Even now the idea of a multiple-record system is not generally accepted.

But it appears to be the only way in which Objectives 1 and 2 in this principle can be accomplished.

The other aspect of this objective which this author completely supports, is that there should be a collocation of related subject access points regardless of the terminology used, or the physical form of the unit represented by the surrogate record. This supports the concept of a multi-media, interdisciplinary information system which was suggested in Chapter 7: Information Systems .

9.2.1.3.4 To show affiliations among subject fields, affiliations which may depend on similarities of matter studies, of method, of use or of applications of knowledge (Shera and Egan 1956: 10; Wynar 1980: 480).

Interdisciplinary studies are becoming more and more popular in research in all fields. Detailed analysis of material; the compilation of common terminology lists and frames of reference, possibly in thesauri, will be a real service to the research community.

The suggestion of a multi-media interdisciplinary information centre servicing all the collection records in the museum can again be seen to be a worthwhile and indeed necessary service for the professional staff.

9.2.1.3.5 To provide entry to any subject field at any level of analysis from the most general to the most specific (Shera and Egan 1956: 10; Wynar 1980: 480)

The trend today in museums and other information organisations is toward in-depth indexing of subjects, seeking to analyse the most complex

subject into its respective components and list these for their possible retrieval in answer to a query. Through the use of synthetic analysis and the concept of "orders" in a structured information system it is possible to meet this objective.

9.2.1.3.6 To provide entry via the vocabulary of the main group of users concerned (Shera and Egan 1956: 10; Wynar 1980: 480).

In museums, one will be dealing with users who are specialists, hence the vocabulary of the discipline concerned must be used: e.g. use scientific names for plants or animals, not vernacular terms. The discipline vocabulary is usually international and hence the terms are understood by all. If possible an extant subject thesaurus or terminology list should be used instead of trying to construct one, as it can be a time consuming occupation.

9.2.1.3.7 To provide formal description of the subject content of an item or discipline related information in the most precise or specific terms possible, regardless of whether the description be in the form of

a word, brief phrase, class number or system (Shera and Egan 1956: 10; Wynar 1980: 480).

This last objective implies the creation of detailed records of an item and the construction of a system which will allow the record to be accessed by any feature in it. The features which can be used and the relationships involved are all still subject to investigation for museum material.

The above objectives require detailed records for museum collections and the construction of structured terminologies or classification schemes for museum information systems which will allow interdisciplinary and multi-media retrieval of data.

9.2.1.4 The subject

The subject of an information retrieval system is the central point about which all else turns, but if one separates the discipline facts from the concept of "subject", the question can be asked "what is a subject?" The best description found was "that which is chosen as a matter of thought, consideration of inquiry" (Concise Oxford 1973: v.2 2167). It fits the museum situation perfectly :

The problem of what a subject is also arose in librarianship and information science when, through the years, attempts were made to place subjects of different kinds into a logical system. This was found to be more difficult than anticipated.

Firstly it was found that the information units being grouped represented subjects of different kinds and that they were either single, complex or compound subjects. They are best analysed and described by S R Ranganathan as being basic subjects and compound subjects. A basic subject is the discipline or discrete area of knowledge to which a document or item belongs (Brown 1976: frame 123). It is also called a basic class (Buchanan 1976: 21). A compound subject is one which deals with more than one subject. It is usually a basic subject plus two or more concepts from various facets of a single subject field (Brown 1976: frame 127; Langridge 1973: 63; Maltby 1975: 34).

Single topic subjects are basic subjects which are again divided into simple subjects and isolates (Encyclopaedia of Library and Information Science: 1987: 151). A simple subject is a basic subject plus

a concept from one facet of that subject field or area of knowledge (Brown 1976: frame 123 and 127; Buchanan 1976: 122; Langridge 1973: 63).

An isolate is an elementary concept which behaves as a unit and is unattached to a basic concept. It makes up the facets of a subject (Brown 1976: frame 114; Foskett 1977: 129; Harrod 1971: 354; Langridge 1973: 63). When isolates are attached to a basic class or a particular discipline they cease to be isolates and become the foci or groups of related facts listed in related categories i.e. organised in facets (Buchanan 1976: 76; Turner 1987: 62).

Multi-topical subjects are those which combine elements from different facets in different ways. Again two types, namely compound and complex subjects are distinguished. The compound subject consists of a basic subject plus two or more concepts from the various facets of a single subject field (Brown 1976: frame 127; Langridge 1973: 63; Maltby 1975: 34).

A composite subject is two discrete subjects which are in a relationship of interaction between more than one kind of thing: the two subjects are dealt

with as the impact of the one on the other or their interaction (Buchanan 1976: 39; 1979: 19; Maltby 1975: 47).

This analysis of the different possible kinds of subject which might be found has been drawn from the theories of library classification developed by S.R. Ranganathan. One of the biggest problems encountered in library classification has been the representation of multi-topical works in the classification scheme (Maltby 1975: 46). Many bibliographic works deal with aspects of a subject or several distinct subjects in one volume. These shades of meaning have to be reflected in the classification coding used.

In museums no studies have yet been done of subject types found in museum information systems, however one can assume that as in libraries the basic and simple subject types will dominate, but that other types may appear especially in two-dimensional material such as bibliographic, archival or manuscript material.

The recognition of subject types being handled is an important part of subject documentation as it will frequently determine the methods used (Maltby 1975:

54). For instance, if one is dealing with a compound subject, facet analysis and its structural methods are applied; if one is dealing with a complex subject, then phase relationships are involved (Buchanan 1979: 18).

9.2.1.5 Philosophy, knowledge and subject documentation

Another important aspect to be borne in mind during subject documentation is the difference between grouping and analysing subjects for knowledge and for retrieval. They can be referred to respectively as bibliographic classification and classification of knowledge or philosophical classification.

Philosophical classification stems from the ideas of the Ancient Greeks as propounded by Aristotle and his successors. They were interested in defining and exploring the world around them (Britannica 1963: 746). Philosophical classification organises knowledge itself registering, evaluating and classifying thought, ideas and concepts for the universal purpose of adequately representing the field of human learning (Wynar 1980: 397). Philosophical classification is concerned with the

intellectual process of deducing what is not already known from the observation of relationships between classes of facts (Sharp 1972: 58).

When libraries began classifying their collections in order to retrieve information, it was natural that they should turn to this method in order to develop bibliographic classification schemes (Sharp 1972: 58). From Aristotle and his successors two ideas crystallised which were used in bibliographic classification until the mid twentieth century, namely that:

- all classification is a whole in which one can seek absolutes or universals
- the principles of classification as expounded in logic are valid for all purposes, practical or theoretical (Shera and Egan 1956: 25; University 1975: 15).

Theoretically classification is concerned with two things, namely:

- the act or process of arranging
- the act or process of defining

(Richardson 1972: 35).

It was assumed that bibliographic classification would also be concerned with defining, for example as in natural history where it is concerned with defining species, and explaining, for example as in natural history where the present status quo is explained by the evolutionary hierarchy (Britannica 1963: 746). But neither bibliographic classification nor museum subject documentation is primarily concerned with the definition and explanation of knowledge (Sharp 1972: 58). Rather these two processes are chiefly concerned with the arrangement of things either in storage (e.g. books on the shelf) or records in subject access files (e.g. the subject catalogue) in an information system which expresses, preserves and displays knowledge (Wynar 1980: 391 and 397). In this broader sense the purpose of subject documentation, the traditional methods of bibliographic classification are not adequate and newer methods, namely synthetic classification techniques, have been developed over the last 40 years (Chan 1981: 211).

In the library the subject indicator serves the dual function of location of material on the one hand and the collocation of related material on the other

(Chan 1981: 125). The first function is represented by the ideal of being able to store individual items or data according to subject and the second function by being able to collocate related material on a subject basis (Chan 1981: 128).

In the library context the first objective is achieved by marking the unit with the code number (notation) which represents its subject concepts. The information units are then stored according to these codes (Turner 1987: 98). The classification code serves as a location device, and as a subject indicator. This facilitates shelving and browsing (Maltby 1975: 16). It is because of this that book-based libraries rely on classification schemes for the physical storage of their stock. If however, the institution decides to use a system of alphabetical subject documentation, problems are experienced in writing the index term on the item itself. There is also still a choice of whether to use an alphabetical or a classified approach for the supporting indexes and catalogues (Turner 1987: 98).

The use of the coded index term as a storage and location device has never been a prominent feature of museum practise. The varied physical nature of the museum information units makes it almost

impossible to implement this approach. Each type of material requires a different storage environment e.g. from ceramics to manuscripts or mine machinery to textiles.

Most museums store items in groups according to their physical nature e.g. bird skins or tables together. This may, in natural history, be further subdivided by classification categories. This type of storage is also easier to control for conservation purposes e.g. bird skins can be treated as a unit and given the correct storage climate. Alternatively the subject can be used as the collocating feature, but museum information units have numerous subject access points. The question then arises as to which access point should be chosen as the physical locus in preference to others. There is no simple answer to this problem.

As can be seen, subject access in a museum context means just and only that. It does not involve storage considerations as well. Subject access in a museum context means the collocation of surrogate records of related material. The easiest way of doing this appears to be the alphabetical retrieval

methods. They are simple to implement and appear simple to use (Turner 1987: 98). This has been the trend in the museum world in the past.

In a multi-media, interdisciplinary retrieval system such as is being suggested, there is no guarantee that the different bodies of knowledge in an information system will fit together to form a complete and comprehensive whole (Langridge 1973: 38). Equally it should be remembered that there are many ways of grouping the same object or idea (Langridge 1973: 18). Different methods of combination can thus be tried but the accepted order of the disciplines concerned should not be disturbed.

Closely allied to the previous point is the question of whether one classification scheme will serve all purposes (Langridge 1973: 55). One school of thought thinks it should, while another maintains that different classifications should be used for different purposes e.g. special collections or one for retrieval and one for storage (Langridge 1973: 55) states that "there is no such thing as a right or a wrong classification, only one which is more or less good for its intended purpose".

9.2.1.6 Subject concepts

The unit with which any system organising knowledge - be it philosophical or bibliographical works, is the subject concept. This is the unit in the information system which is recognised during the analysis phase of the indexing process. More than one concept is usually recognised per information unit.

The concepts are determined by recognising a finite statement, at any level of specificity or generality, which conveys a fact or item of knowledge which may be sought by the user now or in the future (Concise Oxford 1964: 432). These are denoted by terms which may consist of one or more words (Foskett 1977: 59). When incorporated into the system they become the access points by which information sought in the system is retrieved (Brown 1976: frame 40).

Experience has taught that certain access points are most commonly used in the museum context, these being the name of the item or the group to which it belongs. But these approaches alone do not allow the full utilisation of the information content of a museum information system. What the full potential

actually is, is an unknown at this stage as no museum known to this author has a properly developed system or has done research on it.

Orna (1980: 33) postulates that the information sought in a museum information system will be by persons, products, concepts, properties, material, processes, operations, manufacture, places, time, or bibliographical references. No extant system known to the author allows retrieval according to all these access points. The subject documentation system must be able not only to pin point specific and precisely defined items of information but also to demonstrate the complete range of subjects available in the museum and their relations to each other (Langridge 1973: 23). None of the extant systems do so.

9.2.7 Conclusion

In this principle the purpose of the subject documentation has been discussed in relation to the objectives for such a system; the origin of the idea of classification in philosophy and the difference between classification for knowledge and classification for arrangement is highlighted and the units which comprise the building blocks of a

subject documentation system are discussed. The lack of a grasp of these ideas in theoretical museology is also pointed out.

9.3 PRINCIPLE 2: THE CREATION OF A SUBJECT DOCUMENTATION SYSTEM

Suggested principle: Subject documentation is a means of organising and exhibiting the subject content of information units and their relationships in the collections of a single department, institution or group of institutions. This is best accomplished through indexing.

- the user and the use required of the information system will determine how the subject documentation system is structured and the level of specificity implemented
- certain decisions have to be taken, for instance :
 - will control of the indexing terms be at the input or the output stage of the system
 - during input decisions have to be made on:
 - whether term or item entry will be used;
 - whether derived or assigned indexing will be practised;

whether term indexing or concept indexing are practised and

whether pre-or post co-ordinate retrieval methods should be implemented.

- the type of access organisation should also be determined i.e whether alphabetic or structure.
- whether a structured or an unstructured retrieval language is used to organise the index terms

9.3.1 Discussion

The purpose of subject documentation has already been outlined in Principle 1, as has the thought that this purpose is achieved by organising unorganised concepts, impressions or data into a system so that it is retrievable (Buchanan 1979: 10; Langridge 1973: 15). This process is variously called classification or indexing (Buchanan 1979: 10; Classification 1971: 1). For the purposes of this study the term indexing will be used.

Indexing

In the literature of library and information science there is currently considerable debate on what is "indexing" and what "classification". It appears that classification is the older term used in librarianship to denote the methods used for arranging both the information units themselves or surrogate records (catalogue entries) to reveal the subject coverage of the collections (Wynar 1980: 535). The term "indexing" came into use with the development of information science as a separate professional activity and the growth of experimental indexing methods, particularly mechanised ones (Wynar 1980: 536). There is a trend in the more recent literature to use the two terms interchangeably (Turner 1987: 5). The situation has been best summarised by Orna (1980: 20) "the use of the analytical techniques of classification remain essential, but the way into information handling through indexing is becoming the easier one." This is the approach which will prove to be of the greatest use in museums.

9.3.2 Considerations of term selection

The name "index term" is used for any means of subject representation or indicator on an index record. It is a synonym for "access term" and may be verbal or coded. Verbal subject terms were previously called subject headings in library parlance and were drawn from pre-co-ordinated standardised lists (Wynar 1980: 485). The notation code of a bibliographic classification scheme is also an index term (Harrod 1971: 622). In the ensuing discussion the phrase "index term" will be used to mean subject headings in either pre- or post co-ordinated information systems, represented by either a code or a verbal heading (after Buchanan 1976: 74 and Harrod 1971: 622).

The purpose of the index term is to bring together all material with the same theme in one place in the information system (American Library Association 1943: 136). This fulfills one of Cutter's "Purposes of Subject Documentation" discussed in Principle 1.

The index terms should be formulated with both Cutter's "Purposes" and the proposed "Objectives" in mind. In 1904 Cutter suggested certain principles which would enable this to be done (Chan 1981: 128; Wynar 1980: 486). The principles Cutter postulated have been discussed in Chapter 8: Descriptive Documentation : Principle 5.

9.3.3 Considerations in system design

It has been stated that an information system makes information which would not otherwise be visible, retrievable. This sub-principle considers the organisation of subject concepts and the decisions which have to be made at different stages in the design of the system. The following section is a discussion of several of these decisions.

9.3.3.1 Considerations of control

When the information retrieval system is being planned, a decision must be taken on whether control of the index terms will be exercised at the input or the output stage.

Control during input is possible when the habits and probable orientation of the user can be predicted (Kent 1965: 123). Input control is the traditional approach taken by alphabetical pre-co-ordinated indexing systems and enumerative classification schemes. In these systems the index vocabulary is prestructured by the compilers and the documentalist must fit the subject concept into this pre-ordained structure (Turner 1987: 117).

Control during output involves the formulation of a search strategy by the user or the information centre staff. The user's request must be framed in terms of the system (Kent 1965: 123). This is most easily done when the system uses a structured indexing language which makes provision for the recombining of different terms in different ways (Foskett 1977: 98). The methods which allow this to be done are post co-ordinate indexing methods or synthetic classification techniques (Turner 1987: 63, 121).

Conclusion

In the museum situation it is suggested that a measure of control be exercised both at input and output in order to ensure maximum utilisation of available information resources. The relevant techniques are discussed in greater detail later.

9.3.3.2 Considerations at input

At input a number of important decisions must be taken which will affect the form of the system, and probably the quality of the result of a search at output. These decisions are:

- whether term or item entry will be used
- whether derived or assigned indexing will be used
- whether the technique of term indexing or concept indexing will be used
- whether pre- or post co-ordinate retrieval methods will be used

These factors have been partially examined in Chapter 8: Descriptive Documentation: Principle 5. The one which remains to be examined here is the matter of whether to use pre- or post co-ordinated retrieval techniques.

9.3.3.2.1 Pre- and post co-ordinate subject retrieval systems.

The only decision which was not examined in Chapter 8: Descriptive Documentation: Principle 5 is that of which type of retrieval system should be used at output. It may be a pre- co-ordinate or a post co-ordinate system. These terms refer to the time (i.e. input or output) and the manner in which concepts for compound subjects are recorded and retrieved.

Pre-co-ordinate subject retrieval systems are historically the older technique. In this method the constituent parts of compound subjects are co-ordinated in a standard order and form at the time of indexing (Foskett 1977: 73; Langridge 1973: 114; Vickery 1970: 120). The descriptors are found in pre-established standard terminology lists whether verbal or coded index terms are used, such as subject heading lists or enumerative

classification schemes (Vickery 1970: 136). In these schemes the descriptor is a precise statement of the subject, provided it is in the standard list (Buchanan 1976: 105). This means there is great precision in the indexing but at the cost of some rigidity and a complex of rules that have to be learnt by the operators (Orna and Pettit 1980: 52).

In post co-ordinate retrieval systems the co-ordination of the index terms is only done during the search and output stage of the system (Foskett 1977: 73; Vickery 1970: 129). The information unit is analysed into its constituent subject concepts. They are then entered into the retrieval vocabulary as isolates which refer to an identification code for the information unit (Buchanan 1976: 103). It is a highly flexible technique with simpler rules than the pre-co-ordinate approach (Orna and Pettit 1980: 52). But it is dependent on the use of a physical recording medium, such as a computer, which allows the rapid and easy co-ordination of terms at the moment of search (Foskett 1977: 73).

Unfortunately a post co-ordinate system is less precise than a pre-co-ordinate one, particularly in the expression of relationships (Orna 1980: 52) and is likely to yield a higher number of false drops

(Buchanan 1976: 104). The size of the file may also be limited by the type of recording medium used: for instance, notch card or optical co-incidence system or computer memory can only hold so many entries. It is also not easy to operate for untrained enquirers who are unfamiliar with the ways in which the system functions (Buchanan 1976: 104).

But the post co-ordinate system is more flexible in allowing the expansion of a system to accommodate new concepts and subjects.

9.3.3.3. Conclusion

As can be seen the series of choices which have to be made at this point in a system's development are vitally important. It is suggested for a museum information retrieval system that the following choices will produce the desired type of system:

- item entry (because it is the format museums are most familiar with and a change of orientation would prove very difficult for them)

- assigned concept indexing (because it produces a structured retrieval system which is more useful in a research context)
- post co-ordinate retrieval method is used (because it is more flexible than pre-co-ordinate methods)

These input decisions should produce a system which will allow maximum retrieval of information and flexibility of growth to answer the changing research needs in museums.

9.3.3.4 Organisation of information

The definition of indexing claims that information in the information system must be organised so that it is retrievable and shows the relationship between concepts. Several different methods are used to do so. Verbal or coded index terms are used to represent the subject, but both must be structured in some way to logically reveal relationships. The methods used to organise the terms are called retrieval languages (Foskett 1977: 98).

But first the unstructured approach should be examined in order to be able to contrast it with the structured approach. The unstructured approach is also known as word indexing where individual index terms are selected from the information unit and entered directly into the system without exercising any control over them at all (Kent 1966: 122). It is also called natural language indexing (Foskett 1977: 98) or derived indexing (Foskett 1977: 42).

The opposite of uncontrolled indexing is controlled indexing which implies a careful selection of terminology used in indexes in order to avoid scattering related subjects under different headings (Kent 1966: 120). This approach is known as assigned indexing (Foskett 1977: 58) and incorporates a multitude of structured indexing techniques using both alphabetical index terms and classification schemes (Vickery 1970: 83). All these methods help to delimit the scope of each retrievable entry (Kent 1966: 37).

The structured indexing or retrieval languages used in library and information science today are produced by different approaches. The first type to be considered is the alphabetical terminology list which is a list of words which can be used as index

terms (Kent 1965: 124). The conventional type is the subject heading list familiar in librarianship such as the Sears List of Subject Headings (Chan 1981: 136). Each entry is a complete heading - be it a single word or a succession of nouns.

In the modern form of the list the phrases and noun compounds have largely been broken up and individual words are listed separately as in the thesaurus. Cross references in the text help the user to enlarge on the number of words which can be used to locate information units and so increase the number of hits (Vickery 1970: 83).

The second form of structured index language is the classification scheme. It is a classified list of word with an alphabetical index (Vickery 1970: 83). Such lists or classification schemes have certain features, namely:

- the terms that are available for searching and indexing are listed according to their nearness of meaning
- their relations to words that are not used are indicated

- their relationships among themselves are indicated (Vickery 1970: 90, 97).

Two methods are used to construct these classified lists or classification schedules. The first approach is enumerative classification schemes or structured retrieval language based on the theories of classification found in philosophy and logic propounded originally by the Ancient Greeks (Turner 1987: 57). The universe is seen as a totality which is divided up progressively into classes and subclasses to form a hierarchical structure proceeding from the general to the specific (Chan 1981: 210; Maltby 1975: 29). Most of the traditional bibliographic systems have been produced by this means (Turner 1987: 57).

The alternate method for producing a structured indexing language is the faceted or synthetic approach. This method emerged during this century and relies on analysing the subject content of an information unit into its constituent parts and then recombining them to show both the units of thought and the relationships between them (Chan 1981: 211; Maltby 1975: 34; Shera 1972: 70; Turner 1987: 57; Wynar 1980: 395).

Conclusion

In a museum information system with its interdisciplinary and multi-media nature, it is suggested that the techniques appropriate to the nature of the material being handled are used. For instance some of the natural history disciplines have very effective classification techniques. These should be used. Where no appropriate classification scheme exists the analytical methods of synthetic classification should be used to build one. The components of a structured information system are discussed in Principle 4 of this chapter.

9.3.5 Conclusion

The discussion in this principle have shown that the means for organising and exhibiting the subject content of an information system are all available in the theories of classification and information retrieval found in library and information science.

It is argued that a number of decisions have to be made at the planning stage for the creation of a subject documentation system. They involve looking at the user and his anticipated requirements from the system and deciding how these will effect both

the organisation of the index terms and the level of generality or specificity implemented. In the museum context it is suggested the user is a specialist who will use the information system to assist in research being done. In order to meet this user-need, a structured retrieval system is required with access points at all levels of generality and specificity.

This proposed system then has to be organised to allow the retrieval of the information. One therefore looks at the decisions which have to be made at each stage of the development of the system, namely input storage and output.

At input one is faced with detailed decisions as to the type of access point which should be used, how it is arrived at and how it should be organised. In view of the user and the user-need parameters already decided on, it is recommended that item records using concepts arrived at through assigned indexing are organised using post co-ordinate indexing techniques. However it should also be possible to combine post and pre-co-ordinate techniques if the system is going to contain interdisciplinary and multi-media material.

The access to the resulting information either may be through the alphabet or through a coded notation arranged according to a predetermined systematic structure. It is suggested that the use of a systematic structure with an alphabetic index would best meet the needs of the museum clientele.

Finally the question arises of which method, namely pre- or post co-ordinate, should be used to create the systematic structure of the information system. Without doubt the greater flexibility allowed by the post co-ordinate techniques makes it the obvious choice, but many disciplines already have classification schemes created using pre-co-ordinate enumerative techniques. The challenge in the museum world is to find a means of combining both techniques in one system to gain maximum advantage from its interdisciplinary and multi-media nature.

9.4. PRINCIPLE 3: THE ELEMENTS OF A SUBJECT DOCUMENTATION SYSTEM

Suggested principle: The elements of a subject documentation system are:

- the information units which make up the system
- the access points derived from the information units
- the indexing language which analyses and reveals the content of the system

1. The information units produce access points on a wide variety of subjects and relationships, to be input into the multi-media, interdisciplinary information system.

2. The access points are derived from the surrogate records of the information units.

3. The access points can be derived by manual or mechanical means.

- 3.1 The access points are derived using the technique of subject analysis
- 3.2 The indexing policy should be suitable to the institution it serves, namely an in-depth indexing policy in a research institution
- 3.3 The indexing language analyses and reveals the subject content of the information units in the system
- 3.3.1 The different types of language should be considered for different purposes
- 3.3.2 The input considerations for retrieval languages are:
- controlled versus uncontrolled retrieval languages
 - the use of verbal or coded index terms
 - pre-or post co-ordinate verbal headings
 - enumerative or synthetic coded retrieval languages

- the level of exhaustivity decided on

- and finally the level of specificity decided on

3.3.3 The output considerations for a retrieval language are the relevance and recall required for the system.

Each of these decisions must be taken anew with each system designed, because each situation is different.

9.4.3. Introduction

A subject documentation system is made up of a number of elements which together enable it to function properly. These are the information units on which it is based, the subjects which are sought in the system and the indexing language which is used to reveal the subjects and their relationships.

As already outlined modern subject documentation looks at the subjects and their relationships, not just the subjects. The use of synthetic classification techniques has therefore been suggested.

9.4.3.1 The information units which make up the system.

The principles of subject documentation are applied to the surrogate records of information units outlined in Chapter 7: Information Systems. As mentioned initially museum information units are both physical entities (their attributes) and information (associated or museological) which accompanies it. Under the term information units are also included collection items and documentary material of diverse types. The nature of information units has been discussed in more detail in Chapter 7: Information Systems: Principle 3.1.

As can be appreciated, this will produce information of a wide variety of types, subjects and relationships for the proposed multi-media, interdisciplinary information system.

9.4.3.2 The access points derived from the information units

The second element in a subject documentation system is the access points utilised in the system for the retrieval of information. Considerations pertaining

to the choice of access points derived from information units are discussed in greater detail in Chapter 7: Information Systems: Principle 3.12 .

9.4.3.3 Deriving the access points

The term access points is used to mean any finite statement at any level of generality or specificity which conveys a fact or item of knowledge which may be sought by the user now or in the future (Concise Oxford 1964: 432). They are extracted from the surrogate record for use in the information system.

When creating a system based on literature, the title or author can be used as the access points and fed into the system in their entirety (Vickery 1970: 42). In museums the access points for information units vary from names to dates to subjects at any level of generality or specificity. The problem lies in choosing the access points which will be required by the user.

In the information system there are two methods which can be used to arrive at access points, namely full text systems or representations in the form of shorter texts or terms that stand in place of the information unit (Vickery 1970: 42). A full text

system can be used with documentary materials where the computer program is used to automatically create the indexes by recognising the significant terms in the natural language text (Vickery 1987: 121).

But this presents considerable technical problems caused by the sheer volume of material. In practice most information units are represented by "profiles" or representations (Vickery 1970: 42). These representations or profiles may be formed in three ways:

- by extraction from the surrogate record of one or more of the characteristic features of the unit (e.g. name, people or places connected with it)
 - by selective extraction
 - by the assignation of keys (standard descriptors)
- (Vickery 1970: 43).

This process is usually carried out by a human agent who inspects the information unit and decides on the index terms or keys which will be used, i.e. those that are likely to be of interest to the users of the information system (Vickery 1970: 62,119).

Because this process is usually carried out by humans there is a strong likelihood of inconsistency in analysis (Vickery 1987: 19). Experience has shown that these terms, phrases and expressions should be systematised in some way in order to bring the retrieval term and the search term as close to each other as possible. This is accomplished through standardised lists of key words (Vickery 1970: 43). They are used to determine the index descriptions of the unit for the purpose of its retrieval in response to requests for information (Brown 1976: frame 40; Kent 1966: 112).

A standardised list of terms indicates which terms are to be used as descriptors in the system and which terms can be considered as synonyms. The type of list known as a thesaurus also includes terms which are related to the chosen descriptor, as well as those which are broader and narrower in concept (Vickery 1987: 119). These thesaurus relations can

be used to aid the indexer in allocating terms or to help the searcher in choosing terms (Vickery 1987: 120).

The use of standardised lists of descriptors which also reveals structured relationships addresses one of the primary problems of museum records identified by Orna (1980: 43) as a "lack of linkages between different sets of records". And, one could add, between different descriptors.

In specialised information systems it has been found that the descriptors which are most frequently assigned represent subjects (Vickery 1970: 44). These subject access points are derived using a specific methodology, namely subject analysis. The method of subject analysis is applied to the surrogate records of information units in order to recognise the concepts contained in them (Brown 1976: frame 40). Subject analysis can be defined as the recognition of attributes and entities, concepts, and relationships which are the subject concepts inherent in and derived from a museum information unit, which are likely to be useful in serving to fulfill the objectives of the specialised information centre (after Brown 1976: frame 38, 110; Kent 1965: 69; Langridge 1973: 110; Sharp 1965: 28).

These subject access points are recorded in the information system as index terms or descriptors (Kent 1966: 112).

9.4.3.4 Subject analysis

Subject analysis is the first stage in the indexing of an information unit. It is described as "the process of identifying what the information unit is about and deciding on the kinds of terms which will be used" (Turner 1987: 4; Vickery 1970: 37). It is the accurate, unambiguous, consistent and systematic recognition of an access point (Sharp 1965: 28). The term subject analysis or specification is applied to this process (Brown 1976: frame 37; Langridge 1973: 110; Sharp 1965: 28). It has also been called classification, subject indexing or subject cataloguing (Brown 1976: 26; Chan 1981: 125; Orna 1980: 46; Wynar 1980: 390).

The process of deciding on access points to the information in the system can be distinguished into two phases. Firstly scanning the information unit to select a set of words that represent the information content of the item. And secondly deciding which of these are worth recording as being of interest to the users (Kent 1965: 69; Vickery 1970: 76). These

terms or keys will be used to decide the index description of the unit for the purpose of its retrieval in response to requests for information (Brown 1976: frame 40; Kent 1966: 112). They are organised into subject catalogues or indexes according to the subject concepts recognised (Orna and Pettit 1980: 46).

At this first step of subject analysis, namely the scanning of the information unit and its recognition, no controls should be placed on the indexer either as to the number of access points noted or the terms used (Brown 1976: frame 132). This is the most difficult stage as this is the moment when one has to decide which access points will be of interest now and in the future. Existing subject lists or thesauri might also provide a guide.

Yet another problem of subject specification relates to the "who" of doing the abstraction of access points (Kent 1965: 26). It is essentially a job for specialists. Noting the solution offered previously it must be added that each institution must look at its own situation and create a solution to suit the situation concerned.

The recognition of appropriate concepts can be extremely problematic in a museum situation. In museums one is dealing with a wide variety of information units. For written material concepts are expressed in a verbal form but for items there is the verbal (a written, completed collection form) as well as a non-verbal communication (physical appearance) which must be utilised to arrive at the access points required in the system. Depending on the personal knowledge of the indexer it may be done correctly or incorrectly. It is therefore suggested that subject specialists associated with the institution be asked to assist with the initial recording of access points for indexing purposes.

In most information systems there is also the problem of deciding which access points in a system are of current interest only and which of long term interest (Kent 1965: 25). In the museum information centre this predicament seldom arises because all concepts are assumed to be of interest in the present and in the future.

The result of this process is a complex of entities, concepts, and relationships which represent these collections (Wynar 1980: 390). The next step is the translation of the chosen access points into the retrieval language of the information system. The retrieval language organises the concepts and so makes them retrievable (Wynar 1980: 390).

The number of records made for each information unit will depend on the indexing policy adopted. The cost of storing index entries is also a factor to be considered. Studies have shown that the cost of searching is also directly related to the number of entries which have been searched. In automated systems the costs of searching do not increase quite so fast as in a manual or mechanical system with a large number of records (Kent 1965: 26).

9.4.3.5 Indexing policy.

The number and type of access points which are incorporated into a system are determined by the indexing policy of the information system which in turn will directly affect the indexing vocabulary in terms of the number and the type of concepts recorded, and the depth to which indexing is practised.

The number of access points recorded may be only a few words, known as "summarisation". Or all or nearly all the concepts inherent in a unit, this is known as "depth - indexing " (Brown 1976: frame 51; Langridge 1973: 110).

Summarisation involves stating with one or two access points the total subject content of an information unit (Langridge 1973:110). Its opposite, depth indexing entails recording as many or all of the access points relating to a unit in the system. This may be ten, twenty or more access points per unit (Langridge 1973: 110).

Depth indexing is characterised by the inclusion of all the important access points revealed during subject analysis. Exactly which access points constitute important ones will depend on the judgement of the indexer. It allows for the recognition of access points embodied, not only in the main theme of the information unit but also in subthemes of varying importance (Brown 1976: frame 51).

The decision to practise in depth indexing will also determine how many of the potential access points in each information unit should be entered into the system (Turner 1987: 53). This is termed the exhaustivity of the system (Brown 1976: frame 64; Langridge 1973: 110). The greater the number of access points selected for indexing purposes, the more exhaustive is the indexing (Brown 1976: frame 48). These access points may be from major or subsidiary themes, in their entirety or a selection of them (Turner 1987: 54).

In museums, depth indexing is the preferred policy decision because of the institutions research function and the fact that it will encourage maximum utilisation of available resources. However the drawback of depth indexing, namely a decrease in precision of performance, must be recognised (Buchanan 1979: 46). This can be countered to a certain extent by the use of a highly structured retrieval language.

In the museum or library information system one will be dealing with both entities and concepts and the relationships that exist between them. Entities are generally characterised by specific names, such as those for people, places and items; while concepts

are generally intangible things such as ideas or emotions. Links are formed between these concepts and entities by relationships of different kinds. The names given to these entities and concepts is "index terms " or "access points" (Foskett 1977: 42). The effect that entities, aspects and relationships can have on the information system is dealt with in greater detail in Principle 4.

Entities, concepts and their relationships form the subject of the information unit which one seeks to make retrievable in an information system. In order to do so the subject must be specified and encoded so that a record of it can be placed in the system (Foskett 1977: 59).

The possibility of collaboration between institutions has been mentioned, but is very difficult to implement because different indexing policies can make the exercise fruitless. Collaboration will work only when common indexing policies can be agreed to between the different institutions concerned (Kent 1965: 26).

9.4.3.6 Conclusion

The access points which are derived from information units and their surrogate records can provide the indexer with problems. Which methods should be used to derive them and who should do it are decisions which have to be taken.

It is suggested that the analytical methods of subject analysis are used to derive the access points producing a complex of entities, aspects and relationships which have to be organised in order to enable them to be retrieved.

The question of whether the analysis should be done manually or mechanically is discussed at length in the literature. But in the museum context this does not really apply because the material is not all documentary and its highly specialised nature requires insight and knowledge to recognise the access points which should be recorded.

It is suggested the institution specialists are asked to assist in the initial selection of access points. Once this has been done, less highly skilled staff can "translate" the access terms chosen into

the index terms in standardised lists which couch the access points in a form matching as closely as possible the search terms usually used.

A decision also has to taken on the type of indexing which will be practised, whether it will be summarisation or depth indexing. In the museum-research context depth indexing with no limitation on the number of access points should be practised. This is the only form of indexing policy which can hope to meet the research allied requests made of information systems.

9.4.4 The retrieval language analysis

The retrieval language analyses and reveals the subject content of the information units in the system.

The third element of a subject documentation system is the retrieval language which is used to analyse and reveal the subject content of the information units in the system. This has already been briefly discussed in Chapter 7: Information Systems.

The second step in the retrieval or indexing procedure was described as the "synthesis of subject concepts". Brown (1976: frame 132) calls it the "translation" of the access points i.e. the process of converting the access points initially recognised into the term or code number of the indexing or retrieval language. Most retrieval systems use a specialised vocabulary in order to minimise the problems inherent in the meanings of words, and the relationships that exist between concepts and the words that describe them (Turner 1987: 57). By utilising the same retrieval language, the user is able to define the concepts being looked for in the same word or code numbers as were used by the indexer in his descriptions of the access points for information units (Brown 1976: frame 132).

The retrieval language may be a real language, using the sorts of words the searcher uses or it may be a controlled, artificial language such as a classification scheme or a thesaurus, so that the problems experienced with the meanings of word are reduced and the importance of identifying and showing relationships is enhanced. The primary function of a retrieval language is to ensure consistency and facilitate the matching process between the searcher and the information in the

system (Turner 1987: 51). A retrieval language, like all other languages, consists of a vocabulary and a syntax. The vocabulary is the terms selected for the indexing of access points; the syntax is the methods employed to indicate the relationship between the concepts indexed (Brown 1976: frame 137; Foskett 1977: 98). The theoretical basis of both the retrieval vocabulary and syntax for retrieval languages are discussed in greater detail in the following Principle 4 of this chapter.

9.4.4.1 Types of index languages

Retrieval languages come in both verbal and coded forms, but common to all is the "controlled vocabulary" of indexing terms (Brown 1976: frame 137). As discussed in Chapter 7: Information Systems there are two types of controlled vocabulary, either an alphabetical or a classified vocabulary.

The index terms of a verbal retrieval language may be arranged in alphabetical order. Then the exact location of any term in such a language is determined by its position in the alphabetical sequence of terms, as in a dictionary (Brown 1976: frame 137; Foskett 1977: 98). The advantage of a verbal retrieval language is that the index terms

are readily understood by the user, but relationships can only be shown by "use" or "see" and "see also" relationships.

In other coded retrieval languages the terms may be arranged or grouped according to the ideas they express. Then it is termed a classified order (Brown 1976: frame 137; Foskett 1977: 98). This allows the access points to be collocated to show relationships which is useful in an information system serving a research community.

9.4.4.2 Retrieval languages : considerations at input

However in deciding on a retrieval language one must make a number of decisions which will influence the retrieval language chosen and the indexing policy adopted. The decisions are:

- the use of structured versus unstructured retrieval language
- the use of verbal or coded index terms
- the level of exhaustivity decided on

- the level of specificity decided on
- the type of retrieval language used (if verbal, whether pre- or post co-ordinated verbal language; if coded, synthetic or enumerative index language)

9.4.4.2.1 Structured versus unstructured retrieval languages

In building an information system the first decision which has to be made is how to organise the access points so that they can be retrieved. They may be left unorganised (called unstructured or uncontrolled) or they may be organised (called controlled or structured). As the method of organisation is called the retrieval language, it is referred to as a choice between a structured or an unstructured retrieval language (Kent 1965: 123).

The unstructured retrieval language is one in which individual access points are selected from the information unit or its record and entered directly into the system without exercising any control over the terms (Kent 1966: 112). It is also called natural language indexing (Foskett 1977: 98) or derived indexing (Foskett 1977: 42). The concepts

selected are merely listed and no control is exercised over the terms either at the time of indexing or searching (Foskett 1977: 42).

It is the simplest type of indexing and assumes the least amount of subject background or technical skill on the part of the encoder. Frequently the specialist supplies the key words and they are input directly into the system by the clerical staff. They can then be manipulated as required (Kent 1966: 13). The key feature is that no control is exercised over the words. It is the method used to construct concordances, being able to use techniques such as key-word-in-context, key-word-out-of-context, catchword title indexing, citation indexing, automatic indexing, or computer text searching to generate the indexes themselves automatically (Buchanan 1976: 94; Foskett 1977: 42 -57).

In the museum context the use of these methods could prove problematic because one does not always deal with textual information units alone but also visual or physical units for which a text has frequently to be prepared to accompany it first, before one can even start to encode it. Also, in a highly specialised institution such as a museum it may be uneconomic not to structure records. The

presence of synonyms and homonyms and the absence of an indication of relationships is also a drawback in a research context.

The opposite of an unstructured language is a structured language which structures and controls the terms entered into the system in order to avoid scattering related subjects under different headings (Buchanan 1976: 18; Kent 1966: 120). There are different degrees of control and structuring which are practised and are implemented by a trained indexer (Foskett 1977: 58). These systems, also called structured indexing vocabularies, display relationships between terms, either by juxtaposition, as in systematic systems or by reference as in alphabetic systems (Buchanan 1976: 128; Kent 1965: 23).

The subject concepts are usually standardised during the process of being translated into the words or code numbers of the chosen indexing language (Brown 1976: frame 132; Kent 1965: 23). These words then become the index description of the information unit and are a necessary prerequisite for the effective retrieval of information (Brown 1976: frame 132,136; Kent 1965: 23).

They increase recall because they remind the user of other possible search points which might give more information. They also increase precision because they help to narrow the search (Buchanan 1976: 128).

There are two main types of structured retrieval language, namely the standard alphabetical subject list and the structured classification scheme frequently found in libraries. Both methods help to delimit the permissible scope of each retrievable entry (Kent 1966: 37).

In the museum context, where one is dealing with information from disciplines which have a definite vocabulary as well as with users who are usually specialists, it appears to be more productive in the long run to use a structured vocabulary. This means that the relationships between concepts will be revealed in an interdisciplinary and multi-media system which the author presupposes the museum information system will require.

9.4.4.2.2. The use of verbal or coded index terms

The second choice pertaining to structured retrieval languages, is whether to use words (catchword, keyword, index terms) or codes (symbols e.g. numerals or letters) to represent the subject (Chan 1980: 125,209). In the library context a list of alphabetical index terms to represent the subjects in the collection is called a list of subject headings. If codes or symbols are used it is called a classification scheme (Chan 1980: 209). The symbols are referred to as a notation in library science and a coded indexing or retrieval language in information science (Chan 1981: 211; Vickery 1970: 102).

Verbal index terms or subject headings are arranged in an alphabetical catalogue where the headings can be partially structured by the use of punctuation or a predetermined order in which concepts are recorded (Wynar 1980: 487). The alphabetical information system gives a horizontal approach through its random scattering of access points throughout the entire linguistic finding apparatus (Wynar 1980: 481).

Coded or classified entries are arranged in a classified information system according to the order of related concepts laid down in the classification scheme (Turner 1987: 54). The classified information system provides a vertical, hierarchical approach to the information units through its closely related classes and the categories under which material can be identified by means of a logical orderly sequence from the most general to the most specific (Wynar 1980: 481).

If a means can be found of incorporating a highly structured retrieval vocabulary into a subject heading list (as has been done with modest success in thesauri) then the use of natural language terms in an alphabetical subject approach would probably be the most successful for museums. Users communicate verbally, phrase their requests for information verbally and so find verbal systems easier to use, especially when the terminology of the discipline concerned is used (Turner 1987: 51).

The final choice which can be made in the structuring of the system is the type of verbal or coded index language which can be used. In each case it is a choice between two distinct types of system: for a verbal retrieval language the choice lies

between pre- and post co-ordinate verbal index terms and for a coded retrieval language it is between an enumerative or a synthetic retrieval language.

9.4.4.2.3 Pre- or post co-ordinate verbal headings

In the construction of verbal subject headings one has the choice of co-ordinating concepts of compound subjects either at input, called pre-co-ordination, or at output, called post co-ordination.

Pre- co-ordinate verbal retrieval languages are historically the older technique. In this method the constituent parts of compound subjects are co-ordinated in a standard order and are formed at the time of indexing (Foskett 1977: 73; Langridge 1973: 114; Vickery 1970: 120). The descriptors are found in pre-established terminology lists, whether subject headings or classification schemes (Vickery 1970: 136).

In these systems the descriptor is a precise statement of the subject, provided it is in the standard list (Buchanan 1976: 105). This means there is great precision in the indexing but at the cost

of some rigidity and a complex of rules that have to be learnt by the operators (Orna and Pettit 1980: 52).

In post co-ordinate verbal retrieval languages the co-ordination of the index terms is only done during the search and output stage of the system (Foskett 1977: 73; Vickery 1970: 129). The information unit is analysed into its constituent subject concepts, which are then entered into the retrieval vocabulary as isolates referring to an identification code for the information unit (Buchanan 1976: 103). This is a highly flexible technique with simpler rules than the pre-co-ordinate approach (Orna and Pettit 1980: 52). It is, however dependent on the use of a recording medium which allows the rapid and easy co-ordination of terms at the moment of search (Foskett 1977: 73).

Unfortunately a post co-ordinate system is less precise than a pre-co-ordinate one particularly in the expression of relationships (Orna and Pettit 1980: 52) and is likely to yield a high number of false drops (Buchanan 1976: 104). The size of the file may also be limited by the type of recording medium used e.g. a notch card, optical coincidence system, or computer memory which can only hold a

finite number of records. It is also not so easy to operate for untrained enquirers who are unfamiliar with the ways in which the system functions (Buchanan 1976: 104).

And yet, in spite of these drawbacks it would still appear to be preferable to use a post co-ordinate verbal retrieval language in the research environment of the museum information system where the demands of the future cannot be anticipated. Also, the users are a captive audience who can be trained to use a system no matter how complicated it is.

9.4.4.2.4 Enumerative or synthetic coded retrieval languages

In the construction of coded indexing languages the documentalist has a choice of using either an enumerative methodology or a synthetic methodology to build the system.

The enumerative approach begins with the universe of knowledge as a whole and divides it into successive stages of classes and subclasses with a certain

characteristic as the basis for each stage. The progression is from the general to the specific (Chan 1980: 210).

The second approach is the faceted or synthetic approach in which a subject (or information unit record) is broken up into its component parts i.e. concepts, entities and relationships, and reassembled according to the syntax of the retrieval language and the particular unit being portrayed (Chan 1980: 211). Enumerative classification is the result of the traditional ideas and theories that emerge for making scientific and philosophic classification schemes. The theory is based on that proposed by the Ancient Greeks (Turner 1987: 57). It is still the main spring of scientific classification (Orna and Pettit 1980: 46), and underlies all the large traditional bibliographic classification schemes (Turner 1987: 57).

The theory of synthetic or faceted classification schemes which developed during the twentieth century, has been found to be particularly suitable for use in automated systems (Turner 1987: 57). It is a method of analysing a subject into its component parts and has rules for putting these elementary parts together as required to describe

subjects (Langridge 1973: 65). The elements are linked together in a specified order : the subject is synthesized from the elements (Maltby 1975: 34). This procedure may be used in a manual or an automated system.

In the museum the most effective approach will undoubtedly be the synthetic or faceted one as it will allow searches by any of a myriad of criteria in an automated system which will be invaluable in the research context of the museum.

9.4.4.2.5 Level of exhaustivity decided on

In the discussion of indexing policy consideration earlier in this principle, the concept of exhaustivity in indexing was touched on. It is also of importance when considering the indexing language of a system because it determines the type of access points recognised and the number of access points entered into the system.

The indexer, assisted by guidelines in the indexing policy statement, decides how many of the access points recognised in the record of each information unit will be entered into the system as index terms (Turner 1987: 53). This is termed the exhaustivity

of the system (Brown 1976: frame 64; Langridge 1973: 110). The greater the number of concepts selected for indexing purposes, the more exhaustive is the indexing (Brown 1976 frame 48).

These concepts may be from major or subsidiary themes, alone or from or a selection of them (Turner 1987: 54). The exhaustivity of the indexing will determine how many units the user retrieves from an access point. If exhaustive indexing is practised then many units will be retrieved, not all of which may be equally useful (Turner 1987: 54).

Exhaustivity has greater financial implications for the organisation in terms of staff, time and equipment. But there is an increasing trend in that direction because it allows better utilization of available resources (Vickery 1970: 64). In a museum it is suggested that the greatest degree of exhaustivity which can be financially carried, should be implemented because of the research function of the museum.

9.4.4.2.6 Level of specificity decided on

The other important factor to be decided at the input stage of the retrieval language is how specific the index terms are to be. This problem should also be considered in the index policy statement.

The index language should be examined to determine how specific the index terms are. Can concepts be specifically stated or are they subsumed under more general terms (Turner 1987: 51) ? It is also important to bear in mind that the specificity of the system can only be ensured at the input stage : anything omitted then will remain outside the system, permanently (Foskett 1977: 20).

The specificity of the retrieval language is the degree of precision with which each concept can be described (Langridge 1973: 110). It affects the level of precision which users can achieve in the system (Turner 1987: 52).

"Specificity", an important concept in information retrieval, was first mooted by C.A. Cutter in 1904 when he suggested that the most specific and direct

heading or term for an information unit be used (Chan 1981: 131; Wynar 1980: 486). In general the larger the vocabulary the more specific the terminology in it. Most vocabularies contain all the generalised terms for the subject field, therefore the vocabulary is being increased by the addition of specific terms. This leads to the understandable statement that a vocabulary with a larger number of access points and a system that allows those access points to be synthesised is more specific than one with a few terms which does not allow synthesis (Turner 1987: 52).

Brown (1976: frame 49) states that the specificity of a term in indexing refers to the generic level of the concept used. For instance, a species is more specific than a genus. This idea can be easily recognised in the Natural Sciences but not in the Human Sciences where generic levels of concepts are not clearly defined and are only revealed by their context.

The type of query received by a system will determine the level of specificity which is required. Sharp (1965: 15) suggests that generally two types of query are received by an information system; namely a specific query for a definite piece

of information or a generic query about a subject which can mean either general information about a topic or all the information available.

In the museum context it is likely to be the former because one is dealing with subject specialists. Unless it is the start of a new research project, in which case all available information both general and specific, about a topic is required (Foskett 1977: 19 - 20). This means that the retrieval must be as specific as possible. For example, one should be able to ask for information on a dining room table when required and not just retrieve information relating to tables only.

The system must be designed to describe each subject completely and exactly, no matter how complex, and must move easily from broader to narrower concepts and back (Sharp 1965: 49; Vickery 1970: 84).

The need for specificity will affect the depth of indexing practised and the precision required of the retrieval language used (Buchanan 1976: 125; Turner 1987: 52). These topics are discussed elsewhere in this Principle (3.2.3 and 3.3.3. 1).

9.4.4.3 Retrieval languages: considerations at output

An information system is judged by how effective it is. In order to arrive at a proper judgement under different circumstances, standard techniques of measurement must be used. Such techniques have been developed in information science and can usefully be applied to a museum information system. These measurements are "relevance" or "precision" and "recall". They enable a system to be evaluated and altered to improve it.

9.4.4.3.1 Relevance or precision

This is the measurement used to judge the number of useful replies which are received in answer to a request (Foskett 1977: 14; University 1975: 8). It is also defined as the measurement of the ability of a system to screen out irrelevant references (Vickery 1970: 213).

The precision of a system or the amount of relevant material retrieved during a search depends on the specificity of the retrieval vocabulary used (Turner 1987: 52). If a very specific vocabulary is used

then one is assured of retrieving all the highly relevant items in the system but missing the related ones (Turner 1987: 53).

The level of specificity in a system is linked to the level of synthesis possible, particularly in classified schemes. And the specificity of the index terms used determines the precision of the retrieval language. Faceted or synthetic classification schemes allow a high level of synthesis to be built into the retrieval language. In situations where a high level of precision is required, a faceted or synthetic classification system should therefore be constructed (Turner 1987: 64).

There is a link between the number of terms in a system and the precision and specificity rating of the system. The claim made that the greater the number of terms, the greater is the specificity and hence the precision (Turner 1987: 112). This statement should probably be qualified to read "the greater the number of terms in a controlled vocabulary". In an uncontrolled situation synonyms and homonyms will clog the system.

Precision is measured as a "precision ratio" which is calculated as follows :

items. Non-specific vocabularies give a higher level of recall but increase only slightly the relevance of information units retrieved (Turner 1987: 52).

When the measurement is supplied to a system the number of relevant documents retrieved in answer to a search, is looked at against the total number of relevant information units which are known to be in the system (Harrods 1971: 536; Sharp 1970: 60). It is called the recall ratio and is calculated as follows:

Recall Number of relevant documents actually
 retrieved x 100

Ratio Number of relevant documents in the system
(Sharp 1970: 60).

It is a quality control measure by which the effectiveness of a system is judged (Turner 1987: 148).

For the museum user recall is more important than relevance, which is the reverse of the situation in libraries (Foskett 1977: 18). In a research situation the recall of a system should be virtually 100% regardless of the cost because one item of

information can prove or disprove a researcher's theory (Sharp 1965: 15). But precision of the system will determine if recall is achieved at all.

These measures of evaluation should be regularly applied to any information system. Problems are found to arise when there has been no clear definition of the user's need, because information systems should be designed to achieve as close a match as possible between a user's needs and the access points which are input into the system (Foskett 1977: 16). It is obvious that the effectiveness of a system depends on the retrieval of information units relevant to the request (Vickery 1970: 214).

It is equally obvious that a system should be continually tested to determine its effectiveness. The regular application of these measurements will assist in ensuring that the system is indexed to provide answers to the questions asked (Vickery 1970: 214). If possible, provision for regularly taking these measurements should be built into the system, so that it can be done with the least possible hassle.

9.4.4.4 Conclusion

The retrieval languages used in an information system are the means by which such systems communicate information to their users. Two basic types of retrieval language have been recognised, a structured and an unstructured form. This is but the first decision relating to the retrieval languages which will be made during the design of the system.

In the museum context the structured language is chosen because structuring helps to increase recall and precision, important considerations in a retrieval system which will be used to aid research.

As there are also different types of structured retrieval language the following choice which has to be made is between a verbal or a coded retrieval language. Their use in the museum seems to be equally advantageous or disadvantageous. The verbal retrieval language arranges the index terms alphabetically which makes known terms easy to find but scatters related concepts and makes it difficult to show relationships (even though "see" and "see also" references are used). It provides excellent horizontal access to the information in the system

however difficulties are experienced in obtaining vertical access to information. A verbal approach also allows the use of the specialist vocabulary for different disciplines without locking it into a hierarchy reflecting a particular phase in the discipline's development.

The coded retrieval languages arrange index entries according to the sequence of concepts in the classification scheme. This reveals hierarchical and vertical relationships but is more difficult for the user to use. It allows the detailed dissection of relationships which can be particularly useful in the research context.

When a choice is made between a verbal or coded retrieval language the pro's and con's of the structuring methodology used in each case should be examined. The choice is between pre- or post co-ordinate methods or enumerative and synthetic techniques on the other hand. In the museum the ideal choice is to apply the analytical techniques used for building synthetic retrieval languages and to "encode" the access points with standardised index terms so that they may be manipulated post co-ordinately in an automatic system. This type of

system would give the user the maximum flexibility available at the moment. The thesaurus technique will meet this need.

It is also pointed out that the language is influenced by indexing policy decisions such as the exhaustivity of indexing applied and the specificity of index terms used. These will affect the quality of the answers to searches and how precisely topics can be specified. Decisions to implement exhaustivity or specificity in a system have financial implications for the system, but they will allow better utilisation of available resources.

A retrieval language must also be susceptible to measurement which is done at the output phase of the system. The measurements which are used are precision, relevance and recall. They are units used to measure the ability of a system to respond to the demands made on it. In the museum recall is more important than relevance because a single fact can influence or change a new theory.

It will be appreciated that the museum's need for a structured, verbal, post co-ordinate retrieval language in the information system places high demands on the people who construct it. Many of the

available techniques are still being developed and so provide inadequate instruments. It is a fluid but challenging situation.

9.4.5 Conclusion

The elements in a subject documentation system have been defined as the information units, the access points and the retrieval languages used. Each has a number of aspects which should be considered when a system is being designed. For instance the type of information units will determine whether a system is multi-media and interdisciplinary or not. The access points are determined by the indexing policy on summarisation or depth indexing and the nature of the access points is also determined by the information unit being indexed. These in turn will affect the choice of retrieval language and decisions made on the considerations at input or output for retrieval languages.

9.5 PRINCIPLE 4: THE STRUCTURE OF A SUBJECT DOCUMENTATION SYSTEM

Suggested Principle : The structure of a subject documentation system is determined by the retrieval language which is composed of :

- the retrieval language vocabulary consisting of the index terms and their relationships.
- the retrieval language syntax consisting of the syntax rules and the "orders" or levels which determine the methods used for recombining the elements.

The nature of the terms and their relationships to each other will determine the retrieval language syntax used in the system.

Discussion

Any system such as the subject documentation system which attempts to create order out of chaos must be structured if it is intended to be able to retrieve

logically related concepts. The structure of the system should be logical and based on sound theoretical foundations.

In modern bibliographical and information science retrieval and classification theory there is a model which interprets classifications and indexes as specialised languages designed to optimise retrieval (Vickery 1987: 140). This is the model which is used here. For instance a retrieval language is seen to consist of a vocabulary and a syntax. They are the "building blocks " which can be used to build the synthetic classification recommended for use in a museum information system (Brown 1976: frame 137; Langridge 1973: 112).

The "building blocks" in question are the index "terms" and "relationships" which form the retrieval vocabulary and the "syntax" and "orders" which provide the retrieval syntax with the rules for recombining the elements (Foskett 1977: 98). The retrieval vocabulary consists of the terms selected for the indexing of access points. They are descriptors, specifiers, and entry terms (Buchanan 1976: 74). And the syntax are the methods employed to indicate the relationships between the concepts indexed (Brown 1976: frame 137; Buchanan 1976: 134).

This principle examines the theoretical aspects of the retrieval language. For example, under vocabulary will be considered the types of terms which might be encountered, not the actual index terms as such. It is hoped that this approach will lay the foundations for further theoretical work.

9.5.1 The retrieval language vocabulary

The retrieval language vocabulary for a subject documentation system consists of the index terms and their relationships. Problems are experienced in discussing index terms and their relationships from a theoretical point of view for museum subject documentation because there is no theoretical terminology with which to do so. A study of bibliographic classification and information retrieval theory has revealed a plethora of concepts and terms. Each theoretical system seems to develop its own, either inventing new terms or using old terms with different, new meanings. The following is suggested for its possible application in the development of a theory for museum subject documentation.

9.5.1.1 Retrieval language vocabulary (terms)

A vocabulary of four terms is suggested to discuss the different levels of generality or specificity of terminology found in subject documentation. It has already been indicated that in the museum context subject analysis and synthetic classification techniques should be used to build the structured information retrieval system. Several terms are used exclusively with these techniques. The ones considered here are tabulated in Table 6: The Vocabulary of different information systems, at the end of this study.

9.5.1.1.1 At the most general level of the information system terminology hierarchy one is dealing with the term "subject" in both the synthetic classification and subject analysis. It is defined as "the substance (concrete entity or abstract idea) of what is found in or derived from an information unit" (Harrod 1971: 621; Langridge 1973: 110; Oxford 1964: 1285).

The term can most definitely be used in the museum context to signify this general level and also to provide a term for the access points which are fed into the system. It is probably most frequently used to contrast it with descriptive information.

9.5.1.1.2 At the second level of generality, the term used in faceted classification is "main class" and in subject analysis "discipline". The definition offered for the term "main class" is: "a discrete area of knowledge which is co-ordinate with other main classes and which together exhaust the universe" (Buchanan 1976: 88).

In enumerative classification schemes main classes were usually based on a philosophical scheme and frequently led to rigidity as knowledge changed over time and the classification scheme did not. (Austin 1972: 220; Foskett 1977: 155; Langridge 1973: 59; Maltby 1975: 56). They are arrived at deductively and their scope, size and number depend on the whim of the classificationist (Foskett 1977: 155).

In synthetic classification, main classes are arrived at inductively rather than deductively, but in spite of this they appear to be the same (Foskett 1977: 155). Ranganathan suggested that "main classes

are conventional, fairly homogeneous and mutually exclusive groups of basic classes" (Foskett 1977: 155). In practice the technique of facet analysis is usually applied with "postulated" main classes rather than to an analysis of knowledge (Buchanan 1979: 110). So the issue is side stepped altogether. In fact Austin (1972: 219) states that if main classes had not emerged in classification, it would have been necessary to invent them, they are so useful!

In subject analysis and for the purposes of creating a structured information system, a "discipline" should be seen as "a distinctive area or branch of knowledge" (Langridge 1973: 36; Oxford 1964: 347). They are recognised as basic and relatively stable areas of knowledge, distinctive in kind and few in number (Brown 1976: frame 92). They are useful for organising knowledge both theoretically and practically.

In the museum the "discipline" concept is very relevant because museums are traditionally organised into departments based on different disciplines e.g. History Department, Zoology Department etc. In an interdisciplinary, multi-media information system for an institution it is the first factor which will

be sought; in a departmental system it is such a fundamental assumption that it will not even be recorded.

It is suggested that the term "main class" is used for the second level of complexity in the retrieval language vocabulary.

9.5.1.1.3 At the third level of organisation facet analysis recognises "facets" and subject analysis "categories". A facet is defined as a group of similar things within a broader category or discipline which share a characteristic in common (Foskett 1977: 129; Harrod 1971: 252; Maltby 1972: 34). They are always seen within the context of the discipline category or main class to which they belong (Brown 1976: frame 112; Maltby 1972: 34).

Facets were first postulated as a unit in classification by S.R. Ranganathan in 1933; this concept has since proved to be a very useful one indeed (Maltby 1975: 34). The need was felt to be able to identify a group of concepts or phenomena which are smaller than a category. A facet is defined as a grouping of concepts or phenomena applicable to a whole or a larger part of knowledge

(Brown 1976: frame 112). The facet fills this gap. It is arrived at by grouping the concepts of a discipline on the basis of shared characteristics (Brown 1976: frame 112).

e.g. Within medicine arms, legs, head etc will form part of the body facet.

The characteristic employed in the definition of a facet is consequently called a characteristic of division and the resulting facet is named by the characteristic used. It is important to note that only one characteristic of division is applied to the definition of any given facet (Brown 1976: frame 112,113; Foskett 1977: 129). Facets are often groupings of materials, processes or people but they differ from subject class to subject class (Turner 1987: 62).

Facets are combined in the classification scheme according to a "specified citation" which is dependent on the classification scheme concerned. It would appear that the theory of facets is applicable to museum information of all types but this supposition should be tested.

A category is defined as a group which has a high generality and a wide application. It is arrived at by the exhaustive application of a single characteristic of division and is used to group other concepts (Brown 1976: frame 115; Harrod 1971: 131; Oxford 1964: 188; Shera and Egan 1956: 27; University 1975: 16; Wynar 1971: 131). Categories are seen to be more general than classes (Shera and Egan 1956: 27). They are the grouping of ideas or phenomena which constitute the background to all thought (Shera and Egan 1956: 27; University 1975: 16). The chief categories of phenomena are those of common experience e.g. categories of entities, categories of activities and categories of properties (Langridge 1975: 40). But each philosophical scheme or period defines its own. For bibliographical classification the Classification Research Group suggests that there are only two main types of categories: entities and attributes (Foskett 1977: 207).

Categories are used in a hierarchical context in an enumerative system and in a synthetic system in a prescribed citation order. This concept is definitely applicable to museum information systems but is likely to be confused with the terms "class" and "facet". A class has been defined as "a group of

things which share one or more characteristics in common, which are not shared by members of other groups. The members are alike in essentials, characters, properties or relations by which the group itself is defined" (Buchanan 1976: 33; Harrod 1971: 148; Shera and Egan 1956: 33-34; Wynar 1980: 391). From the above definitions it would seem that class and category are terms that are used interchangeably for the median group of concepts in any information system. In enumerative systems the term "class" is usually used while in faceted systems the term "category" or "facet" appears to be used to denote exactly the same type of group.

The naming of a group which shares common characteristics, appears to be a necessary mechanism in any information system to assist in creating order out of the chaos of the concepts available. However it is suggested that for the museum context the term "facet" be used for this median group of concepts because it is proposed to use synthetic classification techniques. It will also avoid confusion in the minds of natural scientists who deal with the Aristotelian concept of class in the context of their subject specialisation.

9.5.1.1.4 The final level of analysis to be recognised is the fourth level where the two concepts "isolate" in synthetic classification and "concept" in subject analysis appear.

The definition suggested for an isolate is "the name of anything, concrete entity or abstract idea that can exist and behave as a unit, which is defined but has not yet been attached to a given subject context (Buchanan 1979: 46; Foskett 1977: 129; Harrod 1971: 354; Langridge 1973: 63; Maltby 1975: 35). Isolate is a term suggested by Ranganathan for concepts which are unattached to a subject and as yet unorganised (Langridge 1973: 63; Maltby 1975: 35). But they stand in the same relationship to their subject area as other concepts which are subject linked (Brown 1976: frame 121). They are organised according to the facet or array in which they are placed, hence there is no recommended structure for this particular unit.

As the most basic unit proposed in a synthetic classification scheme, the "isolate" concept will obviously have relevance in the museum information system. But yet again it is an untested supposition which should first be tested experimentally.

The term "concept" is the most fundamental unit recognised in subject analysis for bibliographic classification purposes (Langridge 1973: 24). It may be defined as "a sum of recurrent features which enable it to be repeatedly recognised and correctly identified" (Foskett 1977: 59; Shera and Egan 1956: 25; Wynar, 1980: 391). A concept is always found in a certain context or frame of reference which must be recognised (Brown 1976: frame 91; Shera and Egan 1956: 25-26). Without its context or frame of reference a concept is an "isolate" (Langridge 1973: 63). It is always denoted by a term which may be one or more words (Foskett 1977: 59).

Concepts are always linked by relationships of different kinds and these, plus the broader subject groupings need to be recognised before terms or notations can be compiled. In the museum it is suggested that the term "concept" be used as the term for the basic unit in a museum information system.

9.5.1.1.5 Conclusion

From the foregoing discussions and definitions it is suggested that the following terms are used in a museum information system for the different levels of the system:

1st level : Subject

This is suggested because it is common to both systems examined and will allow the identification of definite areas of knowledge in the museum, which might not necessarily reflect either the museum's departmental organisation or the academic disciplines associated with them.

2nd level : Main class

The concept of a broad general grouping of like material within a subject is familiar to most users. It is also necessary to be able to identify such a group by means of a name, both for the organisation of the information and for the conceptualisation of the information system. This term is less likely to cause confusion in the museum situation than

"discipline" which may have slightly different contexts in academia than those used in information systems theory.

3rd level : Facet

As already noted the term facet is considered to be the most applicable to the museum situation.

4th level : Concept

The term "concept" is suggested for the smallest recognisable subject unit in the information system. It is a familiar word, used in a familiar sense and embraces the idea of an isolate as well as concrete entities and abstract ideas. In short it seems to be a very useful unit with which to work.

If this suggested terminology is adopted it will be an important step towards building a theoretical basis for museological subject documentation systems.

9.5.1.2 The relationships inherent in the retrieval language of a subject documentation system

An important element in modern structured subject documentation systems is the idea of relationships between concepts or forms of knowledge (Langridge 1973: 38,41). These relationships are an integral and important part of the subject analysis of information units (Brown 1976: frame 122).

They allow a fuller utilisation of the index terms incorporated into the system. This is a feature of information retrieval and classification which has only been studied in the last thirty years. In enumerative systems the relationships between concepts are determined when the scheme is compiled, so they will not be considered here. Only the relationships recognised in synthetic classification studies will be discussed.

Different types of relationships have been identified during the theoretical and practical work done on classification and information retrieval since World War II, particularly by the Classification Research Group of Great Britain (Foskett 1977: 62).

Relationships are found in the following cases:

- between a thing and its kinds (genus - species)
- between a thing and its properties
- between a thing and its actions
- between a thing and the actions performed on it
- a whole to the part

(Langridge 1973: 41).

The two main groups recognised are semantic relationships and syntactic relationships. The semantic relationships are found between related concepts e.g. water and sea. Syntactic relationships are between unrelated concepts which are co-ordinated to form composite subjects (Buchanan 1979: 17; Foskett 1977: 62 - 63).

Table 7: Types of relationships found in Information Systems, at the end of this study reveals the types of relationships which have been recognised to date. Each worker in this field has identified his own categories. There does not appear to be

agreement on the categories as yet, except for phase relationships. These relationships are examined in greater detail and their possible application to the museum situation indicated where possible.

The question may also be asked: How are relationships indicated in a classification scheme? Traditionally only two methods could be used. The one is by juxtaposition, as in a classified system and by cross reference as in an alphabetical system (Langridge 1973: 75). But in automated systems this is not such an issue because individual concepts can be manipulated as required.

9.5.1.2.1 Semantic relationships

Semantic relationships are permanent and arise from the definition of the subjects involved in a system and the need to be able to search for alternative or substitute terms (Foskett 1977: 62,73). Three types of semantic relationship have been differentiated, namely:

- equivalence relationships
- hierarchical relationships

- affinitive or associative relationships
(Foskett 1977: 63).

They are useful in a systematic information system because they enable the user to extend the search by suggesting substitute terms or additional terms for a particular search. It improves the recall of the system (Foskett 1977: 71).

Equivalence relationships

The equivalence relationship occurs chiefly between synonyms e.g. scientific and common name. It is normal practise to choose one name as the preferred term and refer from others to it (Foskett 1977: 63-65). Foskett (1977: 64) lists a number of cases which are considered equivalence relationships as outlined in the Table 8 at the end of this study.

They are usually shown by "see" references pointing from the non-preferred term to the preferred term

e.g. Cat

see

Felix

This type of relationship will definitely be found in museum information systems, particularly in those that serve both the specialist and the general user. Specialist terms have to be interpreted for the layman in this type of catalogue, which means equivalence relationships are a necessary part of the system.

Hierarchical relationships

Hierarchical relationships are based on the principle of subordination or inclusion (Buchanan 1979: 21). The genus-species relationship of the biological sciences is perhaps the best example (Foskett 1977:65). It has its origins in Aristotelian logic with a concentration on subject-predicate relationships (Sharp 1972: 58) and is an important relationship between concepts (Brown 1976: frame 53).

Foskett (1977: 64) recognises two types of relationship in this group. They are the species-genus relationship and the whole-part relationship which are further elucidated with examples at the end of this study in Table 9: Types of Hierarchical Relationship.

Both the genus-species and whole-part relationships involve the recognition of super and subordinate relationships between :

- a thing and its kinds (primate-ape)
- a thing and a kind of a thing (table and a side table)
- a thing and its processes (birds and bird's respiration)
- a thing and its parts (bird and bird's eye)
(Brown 1976:frame 53; Buchanan 1979: 17).

The relationship between co-ordinate classes also falls within this group (Brown 1976: frame 49; Buchanan 1979: 25; Langridge 1973: 41).

The most serious limitation to the use of hierarchical (or generic) relationships in bibliographic information retrieval systems is that it reveals only one "relational" aspect , namely the vertical, super- and subordinate relationships. Another limitation is that it only occurs within a category.

The hierarchical relationship uses cross references in both directions to show the super or subordinate nature of the relationships. They usually take the form of "see also" references in a pre-co-ordinate alphabetical system or broader-narrower directives in a post-co-ordinate system (Foskett 1977: 67-68). In coded retrieval languages the hierarchy is revealed through the structure of the notation.

The vertical, hierarchical relationship is a very common one in the museum context where one is usually dealing with homogeneous groups of information units. Studies of these groups are frequently comparative or very detailed physical examinations of items which are inclined to be done according to generic relationships (Langridge 1973: 60). This means that hierarchical relationships will be an essential part of the structure of a museum information system.

9.5.2.1.2 Principles of Arrangement

As already stated the Principles of Arrangement are groupings of methods suggested for recombining components of a complex or compound index term in a helpful manner at different levels of a structured information system once analysis, using the methods

of subject analysis and Principles of Division has been completed. The following Principles of Arrangement have been recognised :

- Principle of Collocation
- Principle of Consensus
- Principle of Dependence
- Principle of Hierarchy

9.5.2.1.2.1 Principle of Collocation

The Principle of Collocation is a Principle of Arrangement and is defined as "the juxtaposition of related items according to their degree of likeness in order to display their relationship" (Buchanan 1976: 36-37; Foskett 1977: 157; Harrod 1971: 162; Maltby 1975: 209). The two types of collocation are found namely spatial collocation and size collocation. Spatial collocation is the arrangement of topics which are physically contiguous (Buchanan 1976: 40,143; Foskett 1977: 130; Lancaster 1973: 73) e.g. countries, or parts of a body.

Size collocation is the increasing size or quasi - arithmetical arrangement of topics (Buchanan 1976: 124; Foskett 1977: 130).

The Principle of Collocation enables one of the basic objectives of subject documentation to be accomplished, namely to bring related material together in the information system (Chan 1981: 128; Shera and Egan 1956: 10). It operates at several levels of the information system. As a principle for the organisation of main classes or macro-order it is best exemplified by H.E.Bliss in his "Bibliographic classification scheme" (Foskett 1977: 157; Maltby 1975: 207).

Bliss made an extensive study of earlier philosophical and bibliographic classification schemes and observed that the failure to collocate related subjects was one of their biggest defects (Maltby 1975: 209). He tried to correct this situation by firstly keeping together subjects which tend to be studied together; secondly by keeping together subjects which are considered to be part of a greater whole, e.g. social science and law; thirdly by keeping practical applications with the

theoretical sciences on which they are based, e.g. electronic theory and electronic engineering (Buchanan 1979: 112).

The principle of collocation also appears in micro - order: order in array where it is suggested that information on size and spatial proximity are grouped together. Grouping of this data means placing related data together i.e. collocating it. The "size" data in question is not only physical size but also numerical (Buchanan 1979: 123; Foskett 1977: 130; Langridge 1973: 72)

e.g. in music : solo, duet, trio etc.

The spatial proximity information considered here is not only geographic but any topics which are considered contiguous (Buchanan 1979: 40; Foskett 1977: 130; Langridge 1973: 72)

e.g. counties of England, Countries of Africa, forms of transport.

These applications of the principle are not the only ones, they are merely the most visible. This principle is implicit in all the Principles of Arrangement.

The principle is used in the macro-order and micro-order: order-in-array levels.

If it is assumed that in a museum information system the same emphasis will be placed on "helpful order" then this principle will definitely be applied. However experience may show that other principles will enjoy greater prominence

e.g. evolution in Natural History

9.5.2.1.2.2 Principle of Consensus

The Principle of Consensus is a Principle of Arrangement that can be defined as "the traditional structure of a subject or knowledge in general, as seen by its use by subject specialists or the way in which it is taught" (Buchanan 1976: 27; 1979: 39, 40; Foskett 1977: 131, 157; Langridge 1973: 72; Maltby 1975: 208; Oxford 1964: 174).

This principle is used at different levels of a structured information system. It was first suggested for use at the macro-order level by the American librarian H.E.Bliss (1870-1950) as a method

of arranging main classes. It was suggested as an alternative to the purely philosophic arrangement of main classes (Maltby 1975: 207).

It was called the principle of "Educational and scientific consensus" meaning that bibliographic classification schemes should be organised according to the way in which experts expect the subject to be arranged and the way in which the subject is taught (Foskett 1977: 157; Maltby 1975: 207). It has proved to be an extremely durable approach to the problem of arranging main classes and is still used today where applicable. Unfortunately time has shown that knowledge is not static, whether educational or scientific and so the structure of knowledge also changes, making any scheme derived by this principle dated (Foskett 1977: 157).

At the micro-order: citation order level of the classification it has been suggested as a means of arranging the facets within an individual information unit description. It appears that it can be used in certain subjects but not all (this is explained in the following application) (Buchanan 1979: 39).

At the micro-order: order-in-array level Ranganathan suggests the use of consensus as an organising principle. It is certainly a useful basis of arrangement and this is supported by literary warrant. But subjects are not static and therefore there are relatively few which can be grouped in this manner (Foskett 1977: 131).

As discussed this principle is used at the macro-order, micro-order: citation order and micro-order: order in array level of organisation in any structured information system.

This principle will definitely be relevant to any structuring of information which is done in the museum context in spite of the problems it can cause by being a "static" or stultifying influence in the system. Since it is frequently found that the museum disciplines do not change as rapidly as some others this it need not cause undue problems.

9.5.2.1.2.3 Principle of Dependence

The Principle of Dependence is a Principle of Arrangement and can be defined as : "where one concept is dependent on, or subsidiary to another it should follow the one to which it is subsidiary" (Buchanan 1979: 39,46,112; Foskett 1977: 135; Langridge 1973: 67,71; Maltby 1975: 210).

This principle is found in bibliographic literature under a number of different names, at different levels for instance:

- progression of dependence as a general order of arrangement (Foskett 1977: 135)
- serial dependence in macro-order arrangement (Buchanan 1976: 46)
- gradation of speciality in macro-order arrangement (Foskett 1977: 157; Maltby 1975: 209 - 210)
- whole - part principle in micro - order : citation order (Foskett 1977: 135)

- wall - picture principle in micro-order:
citation order
(Buchanan 1979: 39)

In all these cases one topic is dependent on another, either because one relies on the other or because it is part of it. (Langridge 1973: 67).

It should be noted that this principle is used in all orders, except filing order. A structured museum information system will definitely use this principle if it is constructed according to the principles of a synthetic classification.

9.5.2.1.2.4 Principle of Hierarchy

Principle of hierarchy is a Principle of Arrangement and can be defined as: "a graded order from the simple to the most complex, exhibiting a sequential movement or change in level of complexity, where the broader concept is filed before the narrower" (Buchanan 1976: 66,26,31,73-74; 1979: 40; Foskett 1977: 130; Langridge 1973: 71,72; Maltby 1975: 209,214; Oxford 1964: 419).

This is a very general principle which is found under a different name at every level of the classification.

- at the general order level, it is called "general before special" or "decreasing generality"
- at the macro-order level, it is called "gradation of speciality"
- at the micro-order level: order in array level it is called "order of chronology, evolution, or increasing complexity".

This is the most elementary Principle of Arrangement which can be used and is based on the supposition that the user would first seek general information on a topic before more specific information (Buchanan 1979: 41). Most bibliographic classifications attempt to follow this order because there seems to be an implicit public expectation of it (Langridge 1973: 70). It can be seen to exhibit both "containing relationships" and "developmental relationships" (Buchanan 1979: 40; Langridge 1973: 40).

The containing relationships are those which appear between a main or basic class in relation to its subdivision; genus in relation to its species; whole to a part; and class in relation to its members (Langridge 1973: 70). Foskett (1977: 137) states that these relationships only appear between foci in the same facet (concepts in the same class).

Developmental relationships include concepts such as evolution, chronology, and increasing complexity (Buchanan 1979: 40). They all seem to exhibit the concept of a linear movement from one point to another. It may be sequential, or a change from a simple state to a more complex one (Buchanan 1979: 40; Foskett 1977: 130; Langridge 1973: 72; Maltby 1975: 17,124-125). These developmental relationships in particular are used in science. E.C. Richardson expressed it as follows "the order of the sciences is the order of things and the order of things is the order of their complexity" (Langridge 1973: 71).

The term "hierarchy" is used for this principle because it can encompass movement in either direction or an increase in complexity. This principle is used to prescribe the sequence in which classes or groups of items are organised on the

shelf, in storage or in the subject documentation. It will most definitely be used in museums in both contexts.

9.5.2.1.3 Conclusion

The term "syntax" is divided into two categories :

i) "Syntax A" which is a general term to refer to the grammar rules of a retrieval language and the levels at which they occur.

ii) "Syntax B" are the principles used in defining the grammar rules of a retrieval language. Two types of principles are found, the Principles of Division which determine the groupings (classes or facets) found in a subject documentation system and the Principles of Arrangement which are the methods of recombining the components of a system in a helpful manner.

Both types of syntax are essential in a retrieval language operating at different level in the structuring process. Each of these groups of principles is then also divided up further, the Principles of Division having three components and the Principles of Arrangement four.

The components of the Principles of Division are:

- the Characteristics of Division
- the Principle of Museum Warrant
- the Principle of Aspect/Entity Dichotomy

The Characteristics of Division are the inherent and distinctive features shared by members of a class which differentiates them from other classes, used in assembling things according to the degree of likeness to make a specific class or facet. It is used both inductively and deductively in subject documentation systems and definitely appears in museum subject documentation systems.

The Principle of Museum Warrant is either the organisation of knowledge according to the collection or information units present, or the placement of a class at the beginning of a sequence instead of its logical place because of local interest. The museum subject documentation system will definitely use this principle in the first

context mentioned, because an information system reflects the collection it represents and exhibits the relationships inherent in them.

The second context of this principle mentioned has not as yet occurred in the museum situation, to the best of this author's knowledge. It is a method of arrangement which becomes a necessary consideration when a general or "universal" system is being used. And as no such system exists for general museum information systems, it is not a factor at this stage.

The third component is the Principle of Aspect/Entity Dichotomy which is used when either the aspect or the entity feature of knowledge is used as the primary orientation of the subject documentation system. This element is very definitely found in museum information systems. In museums the primary orientation of any information system will be to the entity or item in the collections. This contrasts with the usual library or information system where the emphasis is on the aspect. The integration of aspect and entity features in the reverse situation to the norm requires considerable study before its full implications are realised and ways are developed to deal with it.

The four components of the Principles of Arrangement are:

- the Principle of Collocation
- the Principle of Consensus
- the Principle of Dependence
- the Principle of Hierarchy

The Principle of Collocation is the juxtaposition of related items according to the degree of likeness in order to display relations. Two types of collocation are recognised, those of space and size. This principle is untested in a museum context. It requires further investigation before recommendations can be made.

The Principle of Consensus is the traditional structure of a subject or knowledge in general as seen by its use by subject specialists or the way in which it is taught. This principle is definitely used as a principle of organisation in any museum information system and hence in the subject documentation method adopted.

The Principle of Dependence is found in situations when one concept is dependent on, or subsidiary to another, then it is considered advisable for the concept to follow the one to which it is subsidiary, in any subject documentation system. Again it is a principle which one presumes will occur in the museum situation but research is needed to confirm this supposition.

The last Principle of Arrangement to be considered is the Principle of Hierarchy. It is the grading of concepts from the most simple to the most complex, exhibiting a sequential movement or change in level of complexity where a broader concept is filed before a narrower one. It is found in all levels of a subject documentation system. In the museum situation it is definitely used in every system the author has had the opportunity to examine. In the Natural Sciences it is well developed with a sound body of theory, while in the Human Sciences this is still being done.

As can be seen from the foregoing study the Syntax Principles found in library and information science provide a framework for the development of a theory of retrieval language syntax for use in museum

subject documentation. Of the seven Principles of Division and Arrangement examined four (Characteristic of Division, Principle of Museum Warrant, Principle of Aspect/Entity Dichotomy and Principle of Hierarchy) are definitely used in museum subject documentation. It is suggested that the remaining three (Principles of Collocation, Consensus, and Dependence) could usefully be studied in greater detail for their probable use in a museum context. On the basis of this brief survey it appears further research in the Principles of Syntax could be useful.

9.5.2.2 The "orders" of a structured subject documentation system

The "Orders" of a structured information system are the different levels at which analysis and re-organisation occur (Maltby 1975: 20). This concept emerged from readings of Maltby (1975) and Buchanan (1979) where the emphasis in all the discussions of "bibliographic classification" are placed on choosing the most helpful "order" for recombining concepts to suit a particular situation. If this emphasis is accepted as valid then it must

be recognised at all levels of any information system. It is part of the syntax of an index language.

This touches on a primary problem in bibliographic classification theory namely that classification is essentially a process of breaking information down into the smallest possible units and then recombining them in a manner which is considered useful (Maltby 1975: 54).

In any structured information system the organisation of the information is confined to a linear arrangement which means that some concepts are kept together and others are scattered. Which topics are collocated and which are scattered will depend on the groupings of related subjects found in a particular information system. This is particularly true of compound and complex subjects i.e. those subjects which consist of a basic subject and two or more subjects from the same or different subject fields. Once these have been identified, one has a series of concepts which must be placed in order (Brown 1976: frame 187; Buchanan 1979: 38). The perfect solution is the order which is most helpful in a particular situation.

If the concept "helpful order" is valid then it must be considered at all possible levels of the information system. Different levels have been identified. They are:

- macro-order
- micro-order: citation order
- micro-order: order in array
- filing order

Each is described in greater detail in the following section.

9.5.2.2.1 Macro-order

This is the order of arrangement for the "main classes" of a structured information system (Foskett 1977: 157; Langridge 1973: 71; Maltby 1975: 57). It is important as it determines which subjects are collocated and which are scattered in the retrieval system and on the shelf when the indexing system is also used as a shelving device.

In early enumerative schemes the order of the main classes was determined by the philosophical system or viewpoint on which the classification scheme was based. e.g. Dewey on the Baconian system (Langridge 1973: 71; Maltby 1975: 57). The early classificationists looked to the work of philosophers and scholars on the "universe of knowledge" for guidance on how the scheme should be organised (Maltby 1975: 57).

Then the American librarian, H.E. Bliss developed his classification scheme "A System of Bibliographic Classification" (Maltby 1975: 207). He devoted a great deal of time, thought and study to the development of a "correct order" for the main classes and promulgated several principles which are still in use today for the organisation of main classes (Foskett 1977:156). They are:

- consensus
- collocation of related subjects
- general before specific
- gradation in speciality

The Principle of Educational and Scientific Consensus was the first and probably the most important principle to be formulated. It is concerned with recognising that the way in which specialists organise and teach a subject should be reflected in the information system (Foskett 1977: 157; Maltby 1975: 208). This was in direct contrast to his predecessors and the philosophical basis of classification.

Unfortunately time has shown that knowledge is not static, whether educational or philosophic and so the structure of knowledge also changes, making any system derived by this principle dated (Foskett 1977: 157). But it is still a useful principle.

In order to achieve order within consensus, he went on to suggest three further principles (Foskett 1977: 157). They are:

a) Collocation of related subjects: This is the idea that subjects which have a strong affinity should be placed together (Foskett 1977: 157; Maltby 1975: 209) (It is discussed in greater detail in the previous section 4.2.1.2.1 as the Principle of Collocation, a component of the Principles of Arrangement).

b) General before specific: Bliss attempted to be very careful in always subordinating a specific subject to the more general one (Maltby 1975: 209). (It is discussed in greater detail in the previous section 4.2.1.2.4 as the Principle of Hierarchy, a component of the Principles of Arrangement).

c) Gradation in speciality: Some subjects draw upon the findings of others and are therefore more specialised than the disciplines from which they borrow ideas. Therefore it is argued dependent subjects should follow the one on which they rely (Maltby 1975: 209-210). This idea appears to be derived from the work of August Comte who argued that the sciences which were simple, self-contained and complete, preceded and influenced those which were more complex, derivative and dependent (Maltby 1975: 210; Mills 1972: 33). (This is discussed in greater detail in the previous section, 4.2.1.2.4 as part of the Principle of Hierarchy, a component of the Principles of Arrangement).

These principles were and still are useful, sometimes in other contexts for instance in the retrieval language syntax and the Principles of Arrangement.

The attitudes of classificationists have changed over the last forty years as regards the importance of main class order, under the influence of the theory of synthetic classification. As remarked by S.R. Ranganathan at the Second International Study Conference at Elsinore in 1965 "The order of the main classes is not particularly important as long as it is tolerable" (Buchanan 1979: 111). And a tolerable order is considered to be the one that collocates related main classes and that main classes which depend on, or developed from, or are later than others should follow them (Buchanan 1979: 111)

e.g. Botany and Agriculture being collocated

Mathematics follows Philosophy and is followed
by Chemistry.

The most recent attempt to establish an order of main classes has been made by the Classification Research Group in England in the new system being developed. They have tried to avoid the problems of arbitrary and rigid main classes by applying the technique of facet analysis to the whole of knowledge. But in the overall scheme the larger

subject groups, corresponding to main classes need to be organised. The theory of integrative levels was used for this purpose (Buchanan 1973: 113).

The theory of integrative levels was first advanced by the biochemist Joseph Needham. It is an evolutionary idea which suggests that there is a recognisable order in nature which consists of a progression from the lesser to greater levels of organisation (Buchanan 1979: 114; Foskett 1977: 207). It is thought to produce absolute order of entities based on their increasing complexity, which results from the addition of "qualities" (Buchanan 1976: 75 ; 1979: 114). A new level of organisation is recognised at the point at which entities from lower levels come together, acquire a new identity and are characterised by properties which are not found in entities at the lower level (Austin 1972: 229).

The entities at each level are not mere aggregations of the predecessors: each successive entity displays a more complex organisation than its predecessors (Buchanan 1979: 114). D.J.Foskett suggests that the use of this theory would provide an absolute order for the organisation of information, not one based on views of relationships which is currently

used. The consensus of the profession is that the theory should be investigated and those parts of it which are useful, used (Maltby 1975: 228).

Conclusion

It would seem that there has not been much advance in the recognition of principles which can be used to organize the "main classes" of practical bibliographic classification schemes since the days of Bliss. The principles of collocation, subordination, and gradation keep on reappearing in different guises and appear to be eminently suitable to use in a museum information system.

9.5.2.2.2 Micro-order: citation order

This category of order refers to order between facets. The purpose of structured information systems is to show relationships by the collocation of related subjects (Brown 1976: frame 187; Buchanan 1979: 37). But because the structured system is necessarily confined to a linear arrangement, it means that the classification system will keep some groups together and scatter others. Which are to be collocated and which are to be scattered will depend

on the groupings of related subjects which in turn depend on the philosophy behind the system or priorities which are decided on.

The grouping or scattering of concepts is particularly acute with compound and complex subjects. Then one has a group of subject concepts which must be placed in an order. This is where the central problem arises.

Only the concepts in the facet cited first will be grouped intact. All the concepts in the second facet cited will be scattered. As one proceeds down the row of concepts in each successively cited facet, they are liable to an increasingly higher degree of scatter. The problem is to decide which topic should be cited first and which second (Brown 1976: frame 187; Buchanan 1979: 38).

The constituent parts of a compound subject must always be combined in the same order otherwise items on identical subjects will be in different places (Foskett 1977: 80; Langridge 1973: 67). An obvious choice of order is the need of the user, but it is not always possible to determine this, so general rules for the order in which topics should be placed have to be decided on (Buchanan 1979: 39; Langridge

1973: 6). These rules are known as "citation order", also called "combination order, facet order, or facet sequence" (Brown 1976: frame 172; Buchanan 1979: 38; Foskett 1977: 80).

The term citation order is used to describe the order of constituent concepts for a complex or compound index term. It does not say how to arrange different information units (physically in storage, for instance) in relation to each other (Langridge 1973: 69). The use of a citation order will ensure consistency in the application of the classification scheme and predictability for the user (Foskett 1977: 81).

A citation order is found in both the enumerative and synthetic systems of building a structured information system. In the enumerative scheme the citation order is the order in which a series of characteristics of division are applied at each step of the division process (Brown 1976: frame 172, 180; Turner 1987: 63). In this case the citation order is fixed which may prove problematic where it does not suit the needs of all users (Foskett 1977: 80).

In synthetic schemes the necessity for a linear representation of the subject, as already discussed, is the main problem. This is overcome by a system of cross references or subject added entries as seems most suitable (Foskett 1977: 82).

Various principles of citation have been discussed by different people over the years. Cutter suggested that the normal alphabetical order of natural language be used, unless an attribute other than the first one is decidedly more significant; Kaiser suggested the order of concrete-before-process. Ranaganthan suggested the order of Personality, Matter, Energy, Space and Time for all topics in a systematic information system, or Energy, Material, Personality, Space and Time for an alphabetical information system. Coates developed Kaiser's order further to give Thing - Part - Material - Action - Agent and Vickery proposed Substance (Product) - Organ - Constituent - Structure - Shape - Property - Patient (Raw Material) - Action - Operation - Process - Agent - Space - Time (Foskett 1977: 82). This complex of ideas has been simplified into a few general principles which are used as required. They are:

- Principle of Dependence

- Order of Decreasing Concreteness
 - Purpose, Product
 - Whole, Part
 - Subject/Bibliographic form
 - Consensus
- (Foskett 1977: 135).

The following discussion briefly reveals how these ideas can be utilised. They are not in an order of precedence.

1) Dependence: In cases where one facet is dependent on another e.g. a product depends on the presence of the material it is made from to occur, then the dependent facet should follow the one on which it depends (Foskett 1977: 135). (This has been touched on in the previous section 4.2.1.2.3 as the Principle of Dependence, a component of the Principles of Arrangement).

2) Order of decreasing concreteness: Ranganathan suggested there was only one citation order, namely the order of decreasing concreteness i.e. Personality, Matter, Energy, Space and Time (Foskett 1977: 135). This has been touched on in the previous section 4.2.1.2.3 , as the Principle of Dependence in the Principles of Arrangement.

3) Purpose/Product: Many basic classes represent a subject in which the objective is to construct a particular product or achieve a particular purpose. The end result then becomes the primary facet in that class. It is used especially in Technology (Foskett 1977: 135).

4) Whole-part: Parts should be subsidiary to the wholes to which they belong. The part should follow the whole in subsidiary order (Foskett 1977: 135).

e.g. can - lid

5) Subject before bibliographic form: Generally the subject is more important than the form in which the work is presented. This is disregarded for items which are more useful if grouped together (Foskett 1977: 14).

e.g. encyclopedia or periodicals

This category is not at all applicable to museum collections but is included for its possible application to documentary materials.

Consensus: The idea that the citation order of a subject should conform to the way in which the subject is taught or viewed by the educated is more valid in some cases than in others (Buchanan 1979: 39). It will lead to a fossilisation of the subject as it implies there is a standard approach to the subject which does not change. This is problematic, especially in a museum where research is done. An essential characteristic of research is to upset the established order of things. Researchers will find an arrangement based on the accepted order of knowledge at one point in time less than helpful (Coslett 1977: 136). The solution is to separate the physical storage of information units from the organisation of subject access to them. (This has been touched on in the previous section 4.2.1.2.2. as the Principle of Consensus in the Principles of Arrangement).

Conclusion

The micro-order: citation order of a subject documentation system is perhaps the most important order to be considered because it determines the collocation or separation of subject concepts in the creation of index terms. As discussed the order of the concepts in the index term depend on the principle of organisation used. There are several possible organisations to choose from and it is suggested that the choice be determined by the purpose of the subject documentation system being created.

9.5.2.2.3 Micro-order: order in array

There is also the problem of arranging topics which are co-ordinated or of equal rank within a facet. In contrast to the problem of the filing order of facets this is a question of sequence within each facet. This problem exists as soon as a list of topics arise from the application of one characteristic of division. The resulting set of equal or co-ordinate classes is called an array (Buchanan 1979: 40-41; Langridge 1973: 73; Maltby 1975: 64).

There will be a large number of such arrays in a classification scheme and an appropriate order must be chosen for each (Langridge 1973: 73). The use of a random or an alphabetical order is not helpful as it does not display relationships (Buchanan 1979: 40-41).

Various methods can be used and no one method suits all circumstances. Some methods are restricted to a particular discipline or topic (Maltby 1975: 64). Ranganathan has suggested the following possibilities: increasing quantity, later in time, later in evolution, spatial contiguity, increasing complexity, canonical order, literary warrant, alphabetical order (Buchanan 1979: 40-41; Langridge 1973: 73; Maltby 1975: 64).

Although the arrangement of an array is not as important as that for facets, if correctly done it will undoubtedly also play a part in the optimum usefulness of the scheme (Maltby 1975: 64).

Conclusion

In the museums micro-order: order in array will definitely be determined by the discipline concerned rather than as arbitrary decision by the classificationist. However the documentalist will be left with the problem of organising subject concepts in an interdisciplinary and multi-media information system.

9.5.2.2.4 Filing order

In a theoretical study of the structuring of information one is only concerned with the analysis of classes and their relationships, but in a practical situation there must be an order for arranging information units and the records in the information system. This is called filing order and is the complete order of classes (Langridge 1973: 67).

On an individual record basis filing order has been codified in the American Library Association Filing Rules. However seen generally, two principles have emerged:

1) General before special: It is statutory that a general concept should be stated before the more specific concept. It relates to any subject that is broader than and completely contains another one. This considered to be the most elementary of filing principles and is used particularly in "containing relationships"

e.g. - a main or basic class in relation to its subdivision

- a genus in relation to its species

- a whole to a part

- a class in relation to its members

(Langridge 1973: 70).

These relationships only appear between foci in the same facet (Foskett 1977: 137).

2) Principle of Inversion: This principle is employed when a code derived from the structured retrieval system is used to arrange information units containing both compound and simple subjects in one sequence, either on the shelf or in the

information system. Sometimes the principle of "general before special" becomes inverted (Langridge 1973: 73; Maltby 1975: 65).

Ranganathan suggested that the citation order be reversed and the abstract subject be placed before the concrete one. This ensures that the principle of general before special is preserved in the scheme wherever it occurs for both semantic and syntactic relationships. (Foskett 1977: 139; Langridge 1973: 73-74). If this is not done, one finds that "general" precedes "special" for semantic relationships (those within the same facet) but that in some syntactic relationships general will follow special (Foskett 1977: 139).

Conclusion

These two very simple principles will ensure that the filing order of items and records are in the most useful order possible.

9.5.2.2.5 Conclusion

These principles should not be seen as absolute, they are rather "umbrella" concepts under which a host of specific recommendations regarding order in different categories or at different levels can be grouped in synthetic classification schemes.

Very little comment has been given in this section on the possible museum application of the idea of citation order, because it is a completely unexplored field in museology. And the very complexity of factors considered in arriving at a recommended order prevents the author from even hazarding a guess as to the best possible solution to the problem.

As can be seen the problem of citation order is central to the effectiveness of the classification scheme. The order used, whether a special one determined by the subject or a general one determined by the principles discussed, is an important element in the success of the subject documentation system in meeting the needs of the user.

9.5.2.3 Conclusion

The theoretical framework discussed in this chapter proposes a model of a retrieval language which encompasses a retrieval vocabulary composed of terms at different levels of complexity and relationships between them, and a retrieval language syntax composed of principles for rules (Syntax B) and orders or levels at which the principles can be applied. This model has been shown to be applicable to museum subject documentation systems in a number of specific instances. The other instances derived from library and information science are suggested as possible research topics in the future.